

AVIATION WEEK

APR. 27, 1953

50 CENTS

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Domestic

Western Air Lines DC-6B crashed in San Francisco Bay during an approach to Oakland, Calif., last week, minutes after 44 passengers were evacuated at nearby San Francisco airport. Eight of the 10 persons still aboard were killed.

Continental Airlines set a new air safety record this month, completing 23 years of carrier operations without a single fatality or serious injury to a passenger or crew member.

Bozell Airways fired 500 members of Air Carrier Mechanics Assn. (AFL) at Dallas last week after the workers refused to call off a walkout touched off by the demand of an operative and reassignment of a maintenance crew chief.

Twenty witnesses representing scheduled carrier airlines, Air Force and the Puerto Rican government, are scheduled to testify on the role of aerial surveillance in an transportation during Senate Sen. Russell Conrad's testimony hearings Apr. 23-May 1.

Scheduled airlines turned testicles about one hour this week (Apr. 25) in reply on Dwight Darnley, Texas, suing several and departing airlines carriers for the first time to book tickets.

Lt. Gen. Edward R. Quanda (AF Ret.) is expected to be elected a director of Lockheed Aircraft Corp. at the annual meeting of stockholders May 5 at Burbank, Calif.

Maj. Gen. J. E. Phillips (USAF Ret.), former commanding officer of Cape Cod, Mass., AF research center, has been named to head up Aircraft Industries Assn.'s new general market committee which will draw up a manufacturer's cooperative program in research, engineering, design, development, construction and testing.

Paul D. Foyt, 25, president of American Aircraft Corp., Teterboro, N. J., was killed Apr. 17 when the Sperry Mark 24 he piloted to fly, as the 1953 International Air Race west December crashed near Hillburn, N. Y.

New low-frequency ADF (radioactive direction finder) has been developed by GenCorp. It is increasing static problems of LF equipment and line-of-sight limitations of VHF, source trials by major overseas airlines are scheduled to be held.



SPERRY ROBOT CONTROLS in case of Lockheed DF-16 piloted jet plane and its control system systems into an autopilot checked by ground "test pilots." The DF-16 can be taken off, flown and

landed accurately by radio signals and radio beam ground control stations or man-operated "boom" Lockheed DF-16 jet two-seater. Note antenna pointing above pilot's seat.

Control plant of Texas Aircraft Corp. is the new name of Lancaster, Airplane Corp., merged recently into the parent company.

Texas Gyrobus, World War II chief of aircraft bench and rocket research at the California Institute of Technology, has been named special assistant for Air Force research and development.

Stratoliner has flown more than 85,797,931 mi since the first test went into operation last year ago Boeing Airplane Co. reports.

QF-107 aircraft manufacturers acquired 35 lightnings valued at \$2,600,000 during March, increasing the number of foreign shipments this year to 90 units.

Financial

Douglas Aircraft Co.'s net earnings increased sharply during the first quarter of fiscal 1953 to \$8,308,757, and sales climbed to \$21,654,268—more than double the Santa Monica, Calif., firm's net earnings of \$1,997,096 and \$31,271,845 in sales for the same period of fiscal 1952. Backlog at the quarter's end was \$70,830,000, 55% in fulfilled delivery orders and 17% unannounced.

Reynolds Metals, Inc., Richmond,

N. J., reports record sales totaling \$4,942,800 in 1952, breaking the previous high of \$4,637,700 in 1951. Net profits after taxes declined to \$116,000 from the preceding year's figure of \$145,900.

GenCorp Aircraft Co., Wichita, ended its first half of the current fiscal year with sales of more than \$73 million, an increase of \$2.5 million over the first six months of fiscal 1952. The Wichita manufacturer has ordered a 25-cent stock dividend.

Hawkins Airlines reports net profit of \$129,071 for 1952, compared with \$19,194 in the preceding year.

International

C-46 operated by Agate-Aer Co. crashed and burned near Hanoi, Indo-China, Apr. 16, killing 26 persons.

Bridges Overseas Airways Corp. reports net profits for the first 10 months of its current fiscal year of \$394,000, a \$3,251,200 decrease from the corresponding period last year.

British European Airways began flying Vickers Viscounts this month, adding the turbo-prop transport to Comet jet liners put into operation on BEA routes last year. Company has five Viscounts, 21 more on order.

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Italians Test New Jet Fighter Prototype



AMERICINI SAGITTARIUS is at all-ward construction and features nose intake for its single 300 lb. thrust Turbomeca Marboré turbojet. Note plane's wing braces.



PROFILE VIEW of Sagittarius which is serving as a prototype for an all-weather fighter plane planned by the Italian armed wing. The turbojet exhausts beneath the fuselage under the cockpit. Looking out of the conventional type with retractable tailhook.

COWLS open showing one of seven jet engines

IN FLIGHT the Sagittarius displays its 91-deg wing sweep. Gross weight is only 4,900 lb.



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WHO'S WHERE

In the Front Office

Edward H. Farnes, former Lockheed Aircraft Corp. work manager, has been elected vice president/manufacturing of Pacific Aerospace Corp., Burbank, Calif.
Dennis E. Fette, former director of engineering and assistant to the president of Jack & Hertz, Inc., has joined Royal Electric, Inc., Jenkintown, Ohio, as executive vice president.

N. George Foley is now vice president of American Enka Steel Co., New York.
Harold C. Fellows has been named vice president research of Black Manufacturing Co., Detroit.

Harry R. Goss, former vice president of General Motors, has joined Eastern Air Lines as a management consultant.

Changes

F. C. Stauffer has been appointed general superintendent of Kears Faxon Corp.'s aircraft fabrication department, Willow Run, Mich.

C. A. DeBussche has been named vice president of the airplane leasing group department, General Lease Products Division, Miami, succeeding J. F. Leonard, who resigned to join Cannon Aircraft Co. in Wichita.
Other changes: W. A. Collins, assigned to General's aircraft financing and subleasehold finance departments, and W. H. Bell, now field representative, San Antonio, Tex.

L. M. Goering is air cargo sales manager, Pacific Northwest Airlines.

H. J. Keith has been appointed operations manager for the new Lockheed division of Lockheed Air Transport, Burbank.

Kenneth Arnold has been promoted to engineering assistant supervisor for Lockheed Airlines.

Frederick B. Knapp and Theodore C. Powell are new structural consultants at Cranston, Ind., Midwest.

James A. Green has joined Suburban & Western Airlines as operations manager.
Robert Ross is new assistant director of sales.

Jack M. Rossini has joined the operations department of the Air Transport Area at Annapolis, Washington, D. C.

Honors and Elections

W. J. Kuntz, Jr., British Aviation Corp. executive, has been named the Wright Brothers Medal of the Society of Automotive Engineers for 1952 for his paper on "A New Technique for Investigating Jet Engine Compressor Shell and Other Turbine Characteristics."

Martin Galand, associate vice-president in charge of Military Research Institute, Kansas City, Mo., has been designated to NACA's committee on aircraft construction.

F. H. Channing, general manager of the Air Transport Division, Ralston Equipment Agency, is celebrating his 50th year in flight transportation.

INDUSTRY OBSERVER

• USAF Sabre pilots in Korea report they are now able to outmaneuver MIG-15s at high altitudes with the additional thrust available in turbojet F-86 engines. The General Electric J47-27 that powers the F-86B has well over 4,000 lb. thrust. Sabre pilots report that MIG-15s are operating out of sight lanes at high altitudes trying to follow transverse the new Sabres can make with on turbojet.

• Recent British reports that USAF is considering building a British medium bomber in the United States—probably the Aero Vultures or Vulcan Vultures—are considered good sales propaganda by the Pentagon. USAF believes it is well ahead of RAF on medium and heavy jet bombers.

• United Aircraft Corp. finally has confirmed in a letter to its stockholders Aviation Work's prediction (Feb. 4, 1952, p. 11) that the North American F-100 (Sabre 47) will be powered by a Pratt & Whitney J37 turbojet.

• Douglas Aircraft's logistic crane designed for a 100,000 lb. payload will be designated the C-112 and is scheduled to be powered by four new Pratt & Whitney turbojets delivering about 15,000 equivalent shaft horsepower. The new F8WA turbojet is based on the split-compressor design featured in the J37 turbojet.

• Defense Department has confirmed the Navy's report to Aviation Week (Mar. 14, p. 14) that the \$154-million Westinghouse A40 production program for Ford's Lincoln Mercury Division at Kansas, Mich., has been canceled.

• Convair XP2Y-1 Sea Dart delta-wing water-borne fighter with a hydraulic landing gear made its first test flight recently, remaining aloft over San Diego Bay for about 16 min. Control test pilot Sam Sherrin was at the controls.

• Part of the three Republic Aviation F-500s being developed as three test beds for supersonic propulsion will be shipped to Edwards AFB in flight testing this summer, with the other two planes scheduled to follow shortly. The F-500 program is a joint USAF-Navy venture to test high-speed propellers developed by Curtiss-Wright, Aeroquip's Division of General Motors and Hamilton Standard. An Athena T54 turbojet will power all three F-500s. One of the propeller systems will use two sets of three blades, all rotating in the same direction with controls geared to reconvert the torque.

• NACA is doing basic research at Cleveland on application of atomic power to aircraft propulsion. NACA's research does not involve a nuclear reactor but covers turbines, compression and heat transfer problems.

• Bristol Aeroplane Co. of England will announce shortly final new versions of its Britannia turboprop transport. They are the Mark 200, a four-engine Mark 250, a mixed passenger-cargo version, and the Mark 300, a passenger model. All of the new versions will feature an extra 30 ft. added to the original Britannia fuselage, gross weight of 135,000 lb., and payload of 10,000 lb. Higher gross weight possible by the new Postage Mark 300 rating of 4,150 chbr. BOAC has ordered three Mark 200s, Qantas six Mark 300s.

• First contract for offshore procurement of Hawker Hunter fighters is scheduled to be signed in May soon. Final arrangements will call for more than 5,000 million to be allocated for the project, including production by Hawker in England and building the aircraft main loaves in Billings by Fokker.

• Airline pilots are divided on the question of turning on wing interdetection lights for anti-collision navigation. Some pilots report that these lights tend to create an optical illusion as to which direction the wing-tipped plane is traveling.

More Than Money

Farmhouse dinners by President Eisenhower's top policy National Security Council on the fiscal 1955 aviation budget may go beyond simple money allocations. They will probe national and, perhaps, worldwide air force roles, missions and composition of the air arm.

Observers are watching particularly the outgrowth on guided missile programs, now being pushed by all three services.

Key to some of the decisions may be found in these five policies presented in the President's previous defense speech:

- Eliminate duplicate weapons programs. "We cannot permit to develop in every field all of the time . . . Whenever a new weapon comes from the laboratories, all the services . . . demand the right to use it . . . Herein is the latest important demand of each service to do the research, development, and production work on new weapons. . . ."

- Simplicity of design. "In war, the simple and reliable weapons may, in the light of time and production facilities, be the most satisfactory."

- Emphasis on attack and development. "The progress of science went against getting the much considered today's best weapon just as it can be obsolete."

The Eisenhower defense budget is due to reach Congress by May 1.

Opposition to Defense Cuts

Sen. J. William Fulbright, D-Ark., is leading a strong opposition to the defense cuts in the House. He has introduced a bill to prohibit the defense cuts in the House. He has introduced a bill to prohibit the defense cuts in the House.

- Sen. Richard Russell (Ga.) observed: "When Russia officials actually order (defense) cuts and reductions in the Russian arms programs, we must consider a reduction of our own military strength."

- Sen. Stuart Symington (Md.) wondered why there is no talk of increasing the defense budget, only talk of decreasing it. His point: Since three years ago, Russia has increased its lead in air and submarine lift to deliver atomic attack.

Corrier: Top Priority

Navy again this year is getting top priority in its shipbuilding program to a Fordist-like class. A major-ship program, involving only a small outlay, is the only program with better priority. This means that only construction of vessels all of the 1955 million. Navy wants to delay building out the coming year at a specific bid will back the launching of a third new carrier.

In its authorization for the money, Navy will highlight the No. 1 priority carrier in grant to sub program and set a grant carry-over date as the only effective answer to the sub large USAF program money with Navy that once she looks the deadline there is no effective defense against risks and troubles they might face.

Nuclear Carrier: By 1960?

New's third carrier isn't going to be designed for a nuclear powerplant, as originally indicated. The aircraft now is due the fourth or fifth carrier will be so powered.

With four year construction time, this means it will be around 1960 before a nuclear-powered carrier is in operation.

Some Navy men say any it would have been logical to put the carrier plant priority on the sub plant. Its larger size means lower engineering problems than the smaller sub plant. Some observers say the Navy objection to the ship nuclear power field with the sub because that program won't be coordinated with USAF operations.

Army Air Procurement

Army has put off its push for authority for direct procurement of its own aircraft for the time being.

Army isn't making cooperative over aircraft plants. But it wants authority to go directly to the service with plant acquisition. At present, all Army procurement of fixed plants is done by Air Force.

With a tough battle ahead for its \$200-million help program and a new Administration, Army apparently has decided the time isn't opportune to aim for a show-up on procurement authority. Army continues to think, however, it would save money and time by cutting out troublesome red tape.

Local Service Hopes

Local service lines are now major hopeful of getting assistance from the Canadian government since they are of U. S. aid in production of a plane that would make this operation economic.

There is some optimism that the Canadian government will give Canada, Ltd.'s request for guaranteed purchase of a large number of C-119 bi-engineer transports for government-owned Trans-Canada Air Lines and the Canadian military force.

So far, however, USAF and Navy have turned down development financing of a plane suitable for local service operation because of the initial cost involved. Navy's cost on converting C-47s to Super DC-3s, though, is now reported up to \$425,000. This approaches the estimated cost of a new plane.

Subsidy Separation Notes

- Rep. Carl Albert (Mont.) will lead a fight in House Commerce Committee to kill current subsidy separation legislation. In view of CAR's administrative operation kicking airlines receiving subsidies, he doesn't think a law is necessary now. Hearings tentatively are scheduled to start May 5.

- Indications are that Senate Commerce Committee hearings won't start until two late July or August action.

- Although 24 senators, one fourth of the membership, have rallied in support of the Kennedy Subsidy Separation Bill, vigorously opposed by Air Transport Assn., they are not the key men. Only by Sen. Andrew Schlesinger and Sen. James Cooper, are members of the committee group. Sen. John Kennedy is giving some thought to withdrawing the committee by forcing the legislation in a reorganization of Civil Aeronautics Board. This would be disavowed in the Committee on Government Operations, of which Kennedy is a member. Those action on this committee are co-sponsored by Kennedy's bill Sen. Karl Mundt, Sen. Herbert H. Lehman, Sen. Harry Jackson.

—Katherine Johnson

AVIATION WEEK

CAB Adopts Airliner Cockpit Standard

VOL. 38, NO. 17

APRIL 27, 1955

- Regulation for new-type transports is patterned from proposals of aviation industry and the military.

- New airworthiness requirements also call for means of indicating reversed propeller pitch to pilots.

By Alexander McArthur

Seldom in U. S. aviation history has there been such widespread agreement on a new regulation as first meeting the Civil Aeronautics Board discussed to standardize cockpits of new-type transport aircraft.

Taken to its proposals of the aviation industry and military services, as outlined in its the recent report of the Society of Automotive Engineers cockpit standardization committee, the regulation is part of new aeronautics requirements CAB has adopted to go into effect May 15.

Basic of the SAE cockpit arrangement is three-fold:

- Make reduction of controls (except control column and rudder pedals) forward, upward or downward for increased performance of pilot's cockpit duties.

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- Windup control shall be located on top of a pedestal set of the fireflies, centrally or to the right of the pedestal centerline and not less than 10 in. off the landing gear control.

- Landing gear control shall be located to the left of the centerline of the pedestal.

- Oil Pedals—Like most other aviation proposals, the new cockpit standardization was not adopted without its share of juggling and haggling between industry and the regulatory agencies.

One previous attempt at cockpit standardization by CAB was followed by a single-engine lighter cockpit and was opposed with considerable determination by the transport aircraft industry groups, who already were working on the SAE proposal.

Proposed Standard—The new requirements for location of pedals, windup and pitch controls at the right of the pilot's seat and at least six inches lower than throttle controls.

They also specify that means be provided to indicate to the pilot when a propeller is in reverse pitch.

• Pitching Down—Probably next in importance to the control standardization issue is new transport airworthiness requirements as changes in overall design and equipment limitations requirements for pitching authorities.

Completion of these requirements is necessary only if the aircraft is to be used in oceanic flight.

One of these changes now "it had to be shown that under assumedly possible water conditions the flotation buoy and trim of the airplane would all be acceptable to allow the airplane and occupy the life raft." Emergency release of life rafts would not prevent gas tanks into ocean.

Proble behavior of an airplane during a water landing shall be investigated by model tests in comparison with aircraft of similar configuration for which flying characteristics are known, the committee provides.

• Ventilation—Another step in solving engine engineering problems is a new requirement giving the crew adequate

control of temperature and quantity of ventilation in their compartments. This is a regulation that Air Line Pilots Assn. has campaigned for with data showing the effects of inadequate cockpit ventilation on pilot efficiency.

• Propulsion Tests—Industry equipment previously in the showrooms during a late August over changing regulations and requirements for aircraft engine powerplants (Aviation Week Apr. 11, p. 45).

• Fuel System—The new regulation that would have kept the engine test at 150 lb., instead of raising up to 200 lb. But CAB has followed the industry proposal in very much at which the test run for a new engine test pattern but the engine's operational condition. Separate test runs are provided for single and two-speed engine and helicopter powerplants.

• Exhaust Lighting—Recent Regulations 25.8375, proposed additional experimentation on improving position light and anti-collision light system by airplane operators on a limited number of aircraft up to June 30, 1955, with performance of new exhaust lighting system, including Aircraft Airlines and United Air Lines already have indicated they are adopting as standard the Green anti-collision light, including the new anti-collision light at the tail of aircraft (Aviation Week Apr. 18, p. 16).

Meanwhile, new Section 4b-637 requires the installation of an aircraft engine exhaust system on any of the fuselage in tail, and an explanatory note from the Board points out it is intended to provide a standard broad enough to include substantially all the existing non-reversible light systems, while permitting further experimentation.

• Helicopter Changes—A series of amendments to Civil Air Regulations Part 6 includes a list requirement that helicopter crew sufficient had to be at least one-hour position at maximum continuous power and rpm (2.5 feet of this requirement, an get away, self-ignite engine with rotor short-circuit, will be studied by industry).

Other new helicopter provisions permit the manufacturer to measure rotor lift equal to at least half the design maximum weight in standard conditions involving landing speed loads. They also require additional provisions for landing gearpower lift to assure

that a controlled auto-rotational landing can be made within five minutes after an engine flare starts.

The new zero-emissions requirements also include:

- **Fire protection.** Additional fire protection for zero-emissions is required in Sections 48.401, 48.404 and 48.405 amendments. Newly certified air planes must install a new extinguisher in the baggage Zone 1 and baggage accessible area in Baggage Zone 3. Airplanes manufactured after June 30, 1974 must have fire resistant lines to protect landing gear systems and other fire extinguishers in Zone 1 or the forward accessible area in Zone 3.

- **Aircraft weight.** Amendment of Part 3 dealing with zero-emission aircraft in normal, climb and descent categories limits its applicability to planes weighing a maximum of 12,500 lb. or less and

maximum flight manual requirements for airplanes of 6,000 lb. or less. However, comparable information is required to be provided in placards, markings or manuals.

- **Inspection procedure.** Aircraft manufacturers and building Civil Aviation Administration production certificates are required by an amendment to Part 1 to establish approved production inspection systems for their products within six months after issuance of type certification for it. This amendment also delegates inspection responsibility to manufacturers for certified products.

Industry spokesmen took a dim view of this amendment in its present stage but felt as an attempt by CAA to level all manufacturers to get production certificates, issued on a voluntary basis last October.

Let Investors Share Air Profits: Damon

Just about everyone connected with an transport except the aviation industry itself is making money. Ralph S. Damon, president of Trans World Airlines, says. And if government policies that hold down airline profits do not change, the carrier will be disappointed when they try to lay new, better equipment.

Damon says air progress the last 15 years has benefited:

- **The public,** which gets lower, cheaper service.
- **The government,** which now has available the "best system of air transportation in the world" by postal service, commerce and defense. Two hundred and thirty-five planes of a total

estimated fleet of 650 modern turbo-prop transport have been assigned to the U. S. Civil Air Reserve.

- **Airline employees,** who have shared in improved wages, job security, pension plans and other benefits.

Only the investment job, Damon says, TWA showed \$1.3 million below fares on a gross of \$112 million on its transcontinental routes in 1952, with a net-wadely net loss. For the same period, an International Domestic posted \$100,000 profit before taxes on a gross of over two \$45 million. The carrier president says the low profit on inter-city routes operated resulted from CAF's sharp cut of frequency and rates in the division. He hoped that CAF's present "monocentric view" would be changed.

No Jet Yet—Damon told the Aviation Writers Association in New York this month he would like to see U. S. non-jet transport and airlines overcome Britain's jet lead in a real head-on fashion, without government subsidy. This would be possible if government penalized industry for receiving a larger share of its earnings. But if there is no other way for the U. S. to develop jet transport, Damon indicated he would accept government support, although reluctantly.

Looking into the future, Damon says TWA is not sure to go into either jet or turbo-prop operations. He is pessimistic about the ability of jet transport to operate at a profit in the next few years. "It will probably be eight years before we see jet transport in major than taken service," Damon said, "unless political considerations keep them going."

On purely economic grounds, he thinks early conversion, including the Comet 3 and other designs now on the boards, will still be the way. High fuel consumption of jet planes would prevent their economical operation.

- **Turbine Race—Damon** expects jet transport to be limited to long-haul, high-density routes for some time to come, except where "political considerations" apply.

TWA is working with interest British European Airways' service with turbo-prop Viscounts. For the time being, however, Damon's line is not making any definite between turbo-prop and turbo-jet. "We are waiting to see which line was the race," Damon says.

Fred Lee Approved

Senate Interstate and Foreign Commerce Committee last week unanimously approved the nomination of Fred Lee as Civil Aeronautics Administrator and Senate confirmation appeared assured.



NEW AIRCRAFT TRANSPORT, the Chase C-119B, carries 61 fully equipped troops.

New Chase Carrier Makes Debut

By Henry Lefler

West Newton, N. J.—The multi-purpose Chase Aircraft C-119B turboprop transport made its first public flight here last week before U. S. and foreign military observers and the press. Maj. Gen. Harry L. Sanders of the United Air Command, Langley Field, Va., where the first C-119B will be assigned, was among the spectators.

Infantry troops from Fort Dix and National Guard units helped demonstrate fuel loading and unloading capabilities. The plane is designed to carry 61 fully equipped military troops in dissemination, 62 ammunition crates under the C-119B's sharply rising tail, up the power-operated ramp in only five to six minutes. It holds approximately one minute the troops were inside and outside. Unloading was just as fast. Fuel, oil, water and loads were quickly loaded and unloaded.

- **Stiff Fight—Fighting** a stiff war, Chase chief test pilot Robert M. Howie demonstrated the plane on site off and land within 1,000 ft.

This wasn't the first flight the Aviance series had had. At Eglin Field, Fla., the XC-112 came out on top in USAF's rugged assault transport evaluation in 1946, beating the Fairchild C-119 Packet (strapped down) and the North op C-119C Kiowa. Chase's XC-112 was second.

In the Mexico Airport demonstration last week, the C-119B was being light and strong power reserves. But its short-field characteristics still were apparent. The transport is designed to take off and land over a 30-ft obstacle in 1,350 ft and 910 ft, respectively, at its standard gross.

- **Raise Inside—**The interior of the plane is actively uncluttered, with a row of seven-and-a-half-bunk seats

along each wall and a line of lock-back units down the middle.

Cargo loading is simplified by the ramp, rising about 2 1/2 ft to the cargo deck's base. Tie-down rings, set on a 16-in. grid pattern, can take 10,000 lb. load.

For hospital use, the plane can carry 50 litter patients, six ambulatory patients and six medical attendants. Close-up views show the conversion from assault or cargo transport to ambulance plane takes just a few minutes, with necessary equipment all contained.

- **International Interest—Foreign interest in USAF's new assault transport is warm, according to Michael Strockoff, founder and chief engineer of Chase, who says Taurus is ready to place an order for 15 planes. USAF has approved, but Strockoff is building off-airfield conversion—a underway on Chase's new 52-million plant at Miami Airport and in two other reasonably low-altitude sites.**

Mexico, India and Australia also are interested in the C-119B. Strockoff remembers an air attack in Washington, Georgia Capt. Derek Kingfield, said American West the plane's short landing and takeoff run had proved impressive.

- **Chase and Kaiser—**the Force has ordered a "very substantial" number of C-119Bs for Tactical Air Command and the Army. First production C-119B was built at West Newton, but manufacturer of the AF order is scheduled for Kaiser's Willow Run plant. (Kaiser obtained a 49% interest in Chase in the merger of the two companies; but Mrs. Strockoff retains the controlling 51%.)

Chase, although holding the plane contract, will act as a subcontractor, supplying sub-assemblies for Willow Run. First Willow Run C-119B is expected



HO4S COPTERS IN ACTION



shown in flight as the new Navy Bell XHSC-1 (above) and the Air Force Parafly TH21 (left). The new of the XHSC-1, taken on its first flight, shows the mounting of an F4UWA R340 engine behind the rotor and intake of the rotors. It is a Bell's first tandem rotor model and is designed to carry considerable stores over to hostile enemy sites. The Parafly TH21 Work Horse is now demonstrating its "flying crane" ability by lifting a 2,200 lb. Army Signal Corps communications load along behind the fuselage. This load-carrying factor was demonstrated to the public for the first time during recent collection of the company's 10th anniversary of the initial flight of a Parafly engine, the single-rotor, single-engine PVO on Apr. 15, 1945. The TH21 is the latest U. S. helicopter in production, can carry 12 litters. Rotor speeds 144 rpm.

of the late in June. It is planned to fill lounge orders and use possible overflow for the transport at Chgo's new West Tower plant.

► **Blowing Buses:** The C-121B carries 107-120 seats for blowing into transport routes. It is equipped for both single and tandem to extend its range. Crew normally will be pilot and pilot/navigator.

► **Flange of the production version differs from the prototype in that the tail has been made higher and squared off at the top.**

In addition to the wing, the C-121B has low side doors for emergency exit. The cockpit, located by a ladder from the cabin, is moved and braced by a straddle bulkhead to protect its occupants in case of engine failure.

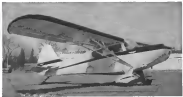
The C-121B can operate as a two-plane, pulling a 16,000-lb glider, or it may be towed, with a without engine nacelles. The prototype glider, it is claimed to be the first ever to be used as a glider, piston plane or jet plane with no change except in propellers.

► **Specifications:** The C-121B is designed to cruise at 295 mph., based at 55 mph. Top speed is given as 345 mph. and cruising speed is 75 mph. Sea level rate of climb is 1,250 fpm.

Cruise range, with auxiliary tanks only, is 2,073 mi., internal fuel ferry tanks, with auxiliary and wing tanks, is given as 3,300 mi.

Design gross weight is 55,200 lb., including a useful load of 23,200 lb. maximum gross at 71,000 lb., with a useful load of 41,300 lb.

Wingspan is 110 ft., length 75 ft. 9 in., height to top of fuselage 31 ft. 9 in., wing loading 61.5 lb per sq ft. The cargo compartment is approximately 8 ft. high, is 9 ft wide by 37 ft long. Usable floor area is 190 sq ft.



TAYLORFRAC PRODUCES 193C TURBINE
This is the latest model turbine produced by Taylor to come off the production line at Conway, Ark. Priced at \$6,790 at the factory, the 193C Turbine can be had with one, three or four shafts down. Turbine

The AF-119C is powered by two Pratt & Whitney R1350-9TW engines delivering 1,900 hp at 2,600 rpm (rated) and up to 2,300 hp at takeoff (peak) with 100-in. diameter. Propellers are aluminum. Standard three-blade, constant speed, hollow-fiber, retractable solid blades, with 15.5-ft. diameter. Landing gear is tricycle type, retractable.

House Committee Cuts NACA Budget

Following recommendations of the new Administration, House Appropriations Committee cut \$73 million from the fiscal 1954 budget of National Advisory Committee for Aeronautics for new facilities.

The shift eliminated three projects from the Truman budget (Aeronautics Week Apr. 13, p. 15): \$4,514,300 for rocket engine research facility at the Lewis Laboratory, \$1,378,700 for a variable Mach number tunnel for a 4-ft-11-in. supersonic tunnel at Langley Laboratory, and \$279,000 for an alteration of the test section of supersonic flow facility at Ames Laboratory.

The committee allowed \$52.9 million for NACA operations, compared with \$75 million proposed in the Truman budget and \$53 million recommended by the new Administration. That would operate new facilities, but it would not allow for increased operations of present facilities at the Truman budget.

The House committee allowed funds for three projects:

► **Langley Laboratory.** High-temperature structural research laboratory, \$4,170,000, boundary-layer control system

for AF-119C, tunnel, \$1,236,200, 38-in. variable Mach number facility, \$7,771,400, increased capacity for Stratton Road substation, \$2,265,600.

► **Wallops Station.** Replacement of pre-flight jet test accumulation, \$716,000

► **Ames Laboratory.** Extension of speed range of 14.5-ft. transonic tunnel, \$940,700.

CAA Ends Freeze On '53 Airport Funds

Civil Aeronautics Administration has released \$5 federal-aid airport projects from the construction freeze imposed only in February by the Budget Bureau. The 63 projects all were part of the fiscal 1953 airport program, for which \$5.5 million was appropriated by the 82nd Congress. An additional \$7 fiscal 1953 projects will see similar action.

There has been no change in CAA and Commerce Department policy on the fiscal 1954 airport funds, which have been eliminated from the budget except making a thorough re-evaluation of the airport program (Aeronautics Week Apr. 28, p. 13).

CAB Studies Cutback Of Air Safety Staff

Civil Aeronautics Board members are considering a plan to close CAB's eight regional safety investigation offices, under the assumption leads to Washington and reduce their number.

Some airline pilots say this would cripple seriously investigators' ability to reach a crash before emergency-urban transport and lowered accident rate. Advocates of the plan cite:

► **Case backlog.** Each regional office costs about \$16,000 annually.

► **Accident prevention.** CAB could not money saved by the plan to hire such staff experts to improve the Board's ability to investigate and regulate one plus modern aircraft equipment and operations, another proponent says.

AF Gives 110 T-6Gs To National Guard

An National Guard shortly will get 110 aircraft T-6G training planes from the U. S. Air Force.

Major Gen Earl T. Ricks, acting chief, National Guard Bureau of the Defense Department, says the two-otter trainer will be distributed to various Air Guard units in quills as they are established in North American Aviation shops.

With the addition of the T-6Gs, Air Guard will have about 976 planes for maintenance and tactical training.



MANEUVERING for steeply fast landing, B-47 comes up an KC-97 tanker below.



CONTACT MANOE, Stratojet squawks at threat. Note engine cowlings close open.



DISMANTLING HOMES for B-47 are used as patch by crew members who flew on the test

B-47 Workout

- **Stratojet, aided by jet stream, hits 794 mph.**
- **Bombs from 40,000 ft. during 1,000-hr. trial.**

A Boeing B-47B Stratojet medium bomber attained a ground speed of 794 mph during a 1,000-hr accelerated test program conducted by Boeing Airplane Co.'s Wichita, Kan., Division under an Air Force contract.

The record-breaking run was recorded when the Stratojet's jet stream was measured into a jet stream at 40,000 ft. while flying from Albuquerque, N. M., toward Los Angeles area. On separate missions, a standard flight from Wichita to the East Coast and return, the B-47 used a jet stream area to cover the 7,750 statute miles in exactly 65 days for an average ground speed of 699 mph.

During the duration the B-47 made 121 flights and covered more than 532,000 mi. under simulated combat conditions which included carrying loads of 14,000 lb. bombs.

► **Standard flight.**—Between averaging 61 to 62 mph, although some lasted 12 to 13 hr. Longest time spent in the air by the 145,000-lb. jet-jet bomber was 14 hr. 25 min. Newly built the mission was flown at night and the plane was refueled in the air four returns by a Boeing KC-97 Stratofreighter 60 hours during the day and after dark.

During its strenuous workout over 30 states, the Stratojet frequently became a target for interceptors, and on one top wide 30,000 ft. over Florida was lured by lightning which panicked fear of the small holes in the plane.

Although some failures were encountered during the better experience the B-47's flexible wings smoothed on the roll through the thunderstorm.

Simulated bombing runs using radar were carried out in simulated sites at Coaldale, Oregon, Ohio and Florida. On a down of these "invis" dummy bombs actually were dropped on the Field AFM bombing range in the Gulf of Mexico. Drops were made from 40,000 ft. and higher.

► **Log 1,000 hr.**—Individual missions were flown to Loring AFB, Denver, Colo., and Maxwell AFB, Tampa, Fla., but otherwise the Stratojet took off and landed at Wichita, except when the plane used Tulsa, Okla., as an alternate when Wichita was closed in.

Boeing project pilot Ed Buckley and Ed Hertz, spokesman of production flight test activities, were pilot mission during the 1,000-hr. program, during which they became the first B-47 to log 1,000 hr. exclusively on the B-47.

Bell Demonstrates New Model 47G

Synchronized elevator and hydraulic control boost added to improve craft's flight characteristics.

New Bell H-13G helicopters, incorporating more hand control and rotor blade improvements over earlier models and use Dual engine in fuel capacity, are scheduled to be delivered as fast as Air Force and Army.

Joe Mathews, Bell sales engineer, has been demonstrating the prototype, a Model 47G, to the Navy and Coast Guard. A modified version will be available to airlines.

Increased CG Travel—Control hand-off has been improved by installation of a synchronized elevator which works with full tilt of the rotor and assures the engine's permissible center-of-gravity travel by 40%. The Model 47G has a 7-in. CG travel, greater than in any helicopter of comparable size or even in some much larger Bell models.

The elevator is a small metal rod with circular end plates of about 3-in. diameter. Flexible bar about 3/16-in. tips and short 12-in. chord. It is attached at right angles to the tail-boom structure, approximately two-thirds of the distance out from the engine.

Power Control—The synchronized elevator and a low-pressure hydraulic power control system, making possible hand-off flight, and other modifications were installed as a result of service recommendations from Army operators of early Bell Model 47 engines in Korea.

Two Hours Hand-off—Turning the aircraft's improved control, Mathews and Bob Dugdale, project engineer, recently flew the prototype 47G hand-off in a two-hour run from Alexandria, La., to New Orleans after turning it out, controlling it solely by shifting from both in the cockpit.

The power control was also used, although it was not generally known at the time, on the Bell 47's recent record endurance flight. Mathews reported that the new machine is so much easier to handle for long periods that he actually flew it from Ft. Worth to Atlanta in one day in approximately 50 hr. 30 min. flying time.

Yves Langlois, in pilot on the helicopter will hold the speed for which it is trimmed within plus or minus 2.5 mph and in smooth air, within 2-4 mph, Mathews says.

A longer cruising device is used with a regular lighter control stick between. The bottom applies a pressure gradient hydraulically to raise the craft to 15 ft above obstacle the stick is moved.

Army pilots who have tried the new control system say that the cockpit is still greatly ease the transition from foot wing to helicopter flying because the luxury features on the stick are removed and the controls have a feel more like foot wing controls.

New Blades—New high lift rotor blades give the improved machine approximately 200 rpm more climb, Mathews says. A simplified aluminum tail rotor makes development and test for the last three years also is incorporated.

Improved fuel system increases range to 1½ hours to 1½ hours. Fuel is stored in 22-gal. to 14 tanks above the engine mount on each side, so close to the center of gravity as possible. Tanks are interconnected so that both can be filled from one side and so that the quantity in either tank will never differ by more than two gallons from the other.

Weight Saving—It was necessary to shift the center Model 47 battery to a balance under various loading conditions. New CG characteristics are so much better that this is no longer necessary.

A larger capacity battery is fixed in an aft position, to balance the radio installation. This allows tail ballast, saving approximately 12 lb.

Other modifications include:

- Installation of a heavy-duty 50-amp generator and regulator replacing the old 25-amp generator.
- Remounting cockpit Plexiglas bulkhead to allow better expansion space for temperature changes.
- Screen-protected weight spring using new lightweight steel coils.
- Approximately 975 more parts control is obtained with the same passage of the sub-tractor pedal by use of a smaller diameter tail rotor control cable drum which results in more powerful sub-tractor pedals. This is structurally possible with new aluminum tail rotor blades.

MATS Increasing Payload of C-124s

Military Air Transport Service is increasing payload of its Douglas C-124 Globemasters by about 1,500 lb. by removing seldom-used equipment. The modification project is slated for completion by the end of this month.

Equipment removed includes:

- Fuel oxygen system, 3,300 lb.
- 90-gal. water tank, 90 lb. for tank and supporting structure (tank full of water weighs about 550 lb.)
- Fuelable oxygen bottles, 14 lb.
- Hot cage, 10 lb.
- Passenger buffet, 64 lb. (from the less C-124s is equipped).

A MATS spokesman said that when carrying troops, the C-124 normally cruises at only about 10,000 ft. Air Force ordered the C-124 design primarily as a specialized belly-cargo carrier and for use as an all-purpose transport.

The new weightstripping project may indicate that the so-called "airline economy" feature in MATS cargo-carrying has now a point over those who consider its primary mission as training and study preparation for special military service.

Jet Runway at Vancouver

A new 5,000-ft. runway designed to handle two Pacific jet transport operations is in specification at Vancouver, B. C., International Airport. The 100-ft. wide runway was financed by the Canadian government through Department of Transport at a cost of nearly \$12 million.



STARFIRE POPS BRAKING CHUTE

With an 18-ft. deceleration chute open to slow its landing roll, a Lockheed P-38C jet demonstrated two-way jet airplane land at a California base. The parachute is stored in a compartment above the tail.



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CANBERRA'S high altitude capability made effective fighter interception difficult.

Flying a Jet Bomber in 'Combat'

What do I like to do, as a jet bomber crew in 40,000 ft. alt? Dick Wood, member of RAF's reconnaissance unit, gave American pilots the following advice after flying in an English Electric Canberra during the recent NATO-RCAF Bomber Command's Laramie Jaeger King.

RAF Bomber Command Pilot, Lincolnshire:—The first requirement for penetration going in a Canberra bombing sortie is to get a stiff physical. My legs, back, blood pressure and ears were checked and I spent one-and-a-half hours in a decompression chamber going up to 37,000 ft. ventilated altitude.

Over the leader, I was issued a fitting kit plus warm blanket, an extra pair of socks and a pressure rest synchronized to an oxygen mask. This rest was used to rest the pulsating pressure of the legs or eardrum of post-oxidation failure.

briefing:—At a post-landing briefing we learned our mission. The Operation Jaeger King at 40,000 ft. was intended for a target area situated northeast through Germany; that he had been checked in the north; and that pressure on forces debriefing the northern sector was to be made by providing tactical bombing support. Our target was an airfield near Stralitz, Germany.

The small navigation, weather and air traffic control beeper was given a significant new signal, the Redon Leader, denoted the techniques to be used.

Normally the Canberra crews a navigator and a navigator/bombarder seated side by side aft of the pilot. The bombardier usually under the instrument panel and assumed a power position as the nose pit. I was strapped in a wicker-like seat next to the pilot, leaving the bombardier's cockpit seat open.

We took off using only a third length of the runway and climbed steeply through clouds with a 200 ft. base. The time we had gone over 55 sec we

were in bright sunshine at 40,000 ft and still climbing. The pressure control valve automatically maintains constant cockpit pressurization above 14,000 ft with a least-odd air mixture blend from the pilot's health-Sayer-Arm oxygen mask. Cabin pressure at 40,000 ft was kept at an equivalent of 15,000 ft. **Canberra Cockpit:**—With the seat not showing under the cockpit, and particularly at night, it gets extremely cold. Down to 17 deg. inside and -62 deg. ft. outside. The seat's glow is the same faded glimmer as that seen at 30,000 ft. There is no dust or moisture. Overhead, the sky is almost black, lightning to a whitish blue on the horizon.

In the cockpit there was only a slight haze from the Arons and no horizon—on fact at this altitude there is no sense of movement, just a constant feeling of hanging in space. Pilot's view is excellent ahead and down. Slight upward movement gives low-visibility-updated downward view. The seat is slightly offset toward the center of the plane to avoid vibration.

In the Canberra's cockpit, forward of the "operator's" upper control console, is the black dial panel with Master-panels on the port side. On the pilot's left is the control console and on the starboard side are the engine instruments.

The blow escape is of swivel construction with VEF seats arranged in both sides. Dry air de-icing is available, but a small patch of ice formed during this flight on the top of the canopy between the points of transparent material.

Fighter interception:—We departed at well over 40,000 ft by way of Lincoln, Massachusetts, and Stralitz. Until then, there had been no sign of fighter interception which was expected to be supplied by Allied Air Force Control Units. But then after we had descended slightly (somehow we were 43,000 ft.) 50 mi northwest of Stralitz, three F-86s appeared overhead flying at 9 o'clock. Their turning circle seemed to be too great and they

passed by astern. Several other Sabots then attempted a head-on attack, but they passed astern and shot by beneath our canopy.

No tail warning radar was fitted to the particular Canberra and what we were at last "shot down" a few moments later, our last indication of an attack came when four Canadian Sabots, without past loss behind and broke every above and below.

Despite the interception the run to the target continued, and in fact of bomb's a picture was taken of the aircraft. Climbing back to normal height (altitude will not permit the target to be located) a course was set for home.

GCA Landing:—Thirty minutes ahead of the aircraft we were alerted (reply from 10,000 to 20,000 ft. at 1000 ft. increments) and made an excellent GCA landing in part of a stream of planes. The two-and-a-half-hour flight had cost me just under 1,000 cc.

We had relief, rather suspicious during the entire trip except for a brief period when certain ground transmitters again were too fast to be reliable. No sleep had been encountered with any of the equipment organs.

Outstanding feature of the trip had been the ease with which the Canberra landed at all altitudes from sea level to well over 40,000 ft. The flight had been also to riding low down with a lightly loaded, powered fighter. This is accounted for by the Canberra's clean design, wing loading less than 50 lb./sq. ft. and special spring leg stress.

New-Style Canberra:—The Ministry still officially gives the Canberra's ceiling as "above 40,000 ft.," although government spokesmen have stated that it is over three miles. At 40,000 ft. the airplane is as stable as any Western fighter, including the Sabot, can get at it. To add insult to honor and fighter control, Canberra has been ordered to operate at fighter level and not to maneuver in their own air. Even under these handicap restrictions, the Canberra's ability to maneuver is superior to other than the Sabot's operations operating Canberra are

considered that they can meet any fighter opposition by climbing, maneuvering or turning into the fighters as they approach from under three to five o'clock. The Canberra is known to be faster than the Meteor and have a greater rate of climb than the Sabot. More than 100 Canberras can be seen.

New Bombing System:—When we took off the Canberra was the lack of a type code for the sidestroke Mk. 8, necessitating a sidestroke as a three-course by a bombardier's nose panel. This has been corrected in the B. Mk. 2 with perfection of a new blood bombing system that replaces old target marking methods. Then the Canberra can po-

point its target accurately in any weather as at night. The new system was used in Eastern Jaeger King and in the final attack on the Newmarket bombing range Mar 21, when the largest single force of Canberras ever operated attacked with precise bombs, hitting the target through fifth cloud. The planes bombarded at five-minute intervals for approximately two hours.

Block Problem:—Greatest problem in high-altitude bombing tonight to fight using the Canberra is a serious problem not restricted to any one type is the large margin of error possible using ordinary bombs.

An Air Chief Marshal Sir Hugh Lloyd

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in basic research, design, development and manufacturing to the advancement of electronic and electro-mechanical weapon control, navigation, and other precision remote control systems. There is every reason to believe that engineering background and techniques—first used successfully in these devices—will see widespread industrial applications. Arma Corporation, Broadway, N. Y.; Maxco, N. Y. Subsidiary of American Bred Corporation.

ARMA ADVANCED ELECTRONICS FOR CONTROL 

put it after Jangle King. "If Bomber Command had been able to add 15 months ago to drop bombs from above 40,000 ft. at a speed of 470 knots, it would have been quite an achievement if they had killed in the night exactly. Now, days away are heading small targets."

Much progress has been made, and the use of bombs carried by the Conqueror has been steadily successful. Full use cannot be made of the plane's load-carrying capabilities until the guided bombs, being developed in England and at Woomera, Australia, has been perfected.

► **Valuable Experience**—Experience gained in operating Canberra, which brings up problems in instrumentation, electrical translation, radar, radio, bomb-door opening and so forth is being deposited in the newer Vulcan. Bradley Page Victor and Avro Vulcan are in production for the Royal Air Force.

The techniques to be used on these newer, heavier types are being passed on to Canberra crews who will form the nucleus of an atomic bomb equipped strategic force.

Due to the complexity, use and cost of these later aircraft they will not be built in quantity and for a long time to come the Canberras will make up the tactical backbone of the Bomber Command.

Boeing Lists Salaries Of Top Executives

Boeing Aircraft Co. paid its president, William M. Allen, \$26,540 in salary and incentive compensation during 1952, the company has reported to Securities & Exchange Commission. Boeing paid all its directors and officers \$493,145 during 1952. Figures in circle records made in 1952 under the company incentive compensation plan relating to 1951.

Wolwood E. Bock, senior vice president, received \$39,255; Fred J. Laufer, vice president in charge of manufacturing, \$73,515; J. E. Schaefer, vice president and general manager of the Wichita Division, \$74,515; Edward C. Wolfe, vice president for engineering, \$47,545; J. O. Yeering, vice president and controller, \$51,465.

Boeing also paid \$4,620,467 during the year to National City Bank of New York for services as registrar of the company's stock. National City Bank also received \$162,752.21 total interest during the year on 1952 loans. Minimum amount of indebtedness of the company at any one time in 1952 was \$14,595,000.

Of 1,622,254 shares of capital stock outstanding Feb. 1, 1953, 15% was owned by Merrill Lynch, Pierce, Fenner & Reese.



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3. **STATUS OF EACH THERMO** couple is taken from jet engine to insure against break-ups that could cause engine trouble.

Aviation Safety

Cornell Center Sets up Targets

Progress in expanding aviation safety research has reached a point where there no longer are any major gaps in fields being attacked by researchers, the third annual survey of the House and Florence Congresses Aviation Safety Center at Cornell University reports.

However, the problem of getting available research data to safety designers and operators and into practical use still remains. This particularly is the case, the survey finds, in the field of human engineering, whose physiological and psychological studies have revealed much useful data applicable to making aviation safer.

While the center has announced its campaign to "push safety and the safety team recognizing the important lack of points out that knowledge now available needs to be presented in a form more directly applicable to aviation problems.

• **Good Record**—The 1972 accident death rate for domestic jet carrier operations was the lowest yet achieved, 0.35 per 100 million passenger miles. It is an outstanding improvement over the 1.3 rate in 1971 and is lower than the last year (1971) reported for all-weather passenger train fatalities, a rate of 0.45 per 100-million passenger miles.

• **Effort and Money**—At a Washington meeting of center's members, committee chairman Harry F. Coggeshall said, "volume of air traffic is increasing so rapidly that only by an ever increasing effort and expenditure of huge sums of money in development and new equipment can we advance or even hold the safety gain we have made."

Specific safety recommendations made by the center:

• **Research** to reduce collision hazards will point out landings and takeoffs, studies made previously by increasing speeds and more emphasis in terminal way-in.

• **Continuing projects** for cockpit and workstation system designs to enable the

crew to maintain alert and operate more efficiently.

• **Support of proposals** for creation of an Institute of Civil Aviation Medicine. In contrast to the millions of dollars spent in engineering and aviation safety research by government and industry, there is only one agency (Civil Aeronautics Administration) with no real jurisdiction for the many problems of crew medical medicine.

• **Protection of plane occupants** from crash loads applied in any direction. National Advisory Committee for Aeronautics is planning a series of 15 major tests on seats with several directional loads in order to establish protection for cabin and seat design.

• **Further research and testing** to improve facilities for evacuation from aircraft, due to crash fire hazards.

• **Control of airplane firm by equipment** used in the aircraft.

• **Industry attention** to NACA and FAA studies on reducing fire ignition sources through fuel tank drainage to withstand crash depressions and structural tank installations, both for new designs and existing transports.

• **Further research** to correct external security noise problems, utilizing practical solutions before additional adverse public reaction forces the issue at a steeper technological to the orderly development of aviation.

• **Continued industry and government studies** of aircraft components and the operational procedures used with data on accident prevention.

• **Further research** in equipment and crew training for emergency situations.

• **Research leading** to adoption of all-weather seats for stress wearing lesser climatic and collision avoidance for commercial as well as military aircraft.

• **Attention** to stability, including



SIKORSKY H-19 COPTER HELPS BUILD BRIDGE

The versatile helicopter in this case the Army's big Sikorsky H-19, is now assisting a helping hand in assembly of a Bully

Bridge at Fort Rucker, N. C. It is used to be the first time a copter has been used to put a Bully Bridge together. In the photo,

left, the H-19 is seen approaching the structure carrying a beam, while at right the craft has lowered the steel into place.

Revere FUEL FLOW SWITCH



SIGNALS INSTANTANEOUS WARNING OF PUMP FAILURE

Specially designed by Revere Corporation for use in the main fuel pump line of the McDonnell F2H twin jet, carrier-based fighter, this precision instrument automatically signals warning of pump failure whenever flow falls below 1.0 gpm due to abnormalities or mechanical breakdowns. As flow diminishes, rotating and calibrating magnets force a pointed aluminum vane toward a closed circuit position, actuating heretofore sealed magnetic switch. Increased flow automatically opens circuit. This unit is unaffected by altitude or other pressure and temperature changes. Primarily designed to indicate a rate of flow of non-corrosive liquids in aircraft, the Revere Flow Switch can serve industry wherever a pump failure warning system is desired.

For additional information read for FREE Bulletin # 1000.



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another precision instrument for air, rail and industry

pushing the recently approved center-line approach light system, as an aid to the pilot in landing.

Operating officers of the Guggenheim Center are Ed. E. F. Wright, chairman, executive committee, Jerome Lederer, director, and K. M. Woodson, administrator. —AMdS

United Air Lines Plans Giant Loading Dock

An elaborate double-deck loading dock designed to meet passenger, baggage and cargo handling is being studied for initial installation by United Air Lines.

The dock is to be located at one end of a White Plains, N. Y., station that the aircraft could be easily towed to a nearby servicing area where it could be serviced with fuel and oil from bi-directionally retractable stands. Other services would provide showers, gasomatic air and electrical power. The layout would employ exhaust heating to keep it free of snow and ice and would eliminate the need for many of present servicing vehicles required.

The passenger loading ramp would contain a waiting area, office, lavatories, storage space for cabin supplies and vacuum cleaner equipment. An area for pre-positioning meals prior to loading ahead of the plane would also be included.

Although the contract is still in the planning stage, according to D. F. Maguire, UAL vice president-transportation services, it would simplify and accelerate many ramp activities. Air dock maintenance, he said, would be conventional compared to purchase and upkeep of present ground equipment. Design of the unit was by F. D. Clayton, airport engineer of the airline's Denver, Colo., operating base.

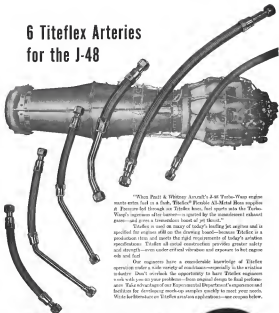
Ansett Fits Jets To DC-3's Fleet

(McGraw-Hill World News)

Melbourne—Ansett Airways plans to modify its DC-3s by fitting them with small French-designed Turbomeca gas turbine auxiliary powerplants to boost takeoff power. Installation of these engines will permit the carrier to extend the plane's range to as far as of the wings, thus making room for 36 seats and lowering gross weight some 1,500 lb. The plane now fly on a conventional basis with 28 seats.

The Australian Federal Dept. of Civil Aviation is cooperating with Ansett and the Commonwealth Aircraft Research Laboratories on the program. Plans of tests will be made available to all Australian airlines.

6 Titeflex Arteries for the J-48



"When Pratt & Whitney Aircraft's J-48 Turbo-Prop engine enters into full-scale production, Titeflex's Flexible All-Metal Hoses supplies 6 Pressure-fed hoses on Titeflex hoses, fuel supply into the Turbo-Prop's expansion of the turbine is required by the standard exhaust gas—and goes a tremendous boost of jet thrust."

Titeflex is used on many of today's leading jet engines and is specified for engines still on the drawing board—because Titeflex is a production item and meets the rigid requirements of today's aviation specifications. Titeflex all metal construction provides greater safety and strength—even under critical vibration and exposure to hot engine oils and fuel.

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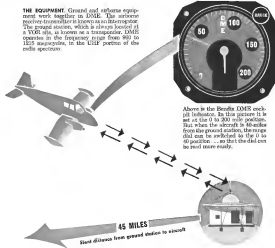
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THE EQUIPMENT. Ground and airborne equipment work together as DME. The airborne receiver-transmitter is known as an interrogator. The ground station, which is always located at a VOR site, is known as a transponder. DME operates in the frequency range from 960 to 125.5 megacycles, in the ILS portion of the radio spectrum.



Above is the Bendix DME cockpit instrument. In this picture it is set at the 0 to 200 mile position. But when the aircraft is 40-miles from the ground station, the range dial can be switched to the 0 to 40 position... so that the dial can be read more easily.

45 MILES
Short distance from ground station to aircraft

HOW IT WORKS. The interrogator in the plane radiates a series of radio frequency pulses. These are received at the ground station when they trigger the ground transponder... which in turn, transmits a reply signal to the plane. The elapsed time, in microseconds, between transmission of interrogation signal and reception of the reply signal is used to compute automatically the short distance between the plane and the point where the ground station is located. No triangulation or other time-consuming effect is required of the pilot. He merely reads the distance in miles on the DME indicator in the cockpit. (In example above aircraft is 45 miles from ground station.)

for the first time... MEASURING EQUIPMENT

To executive type and corporate aircraft, DME means economic, direct flights over unmarked airways... with a positive geographical fix at all times. It makes possible instrument approaches to near-to-destination airports that otherwise might have to be passed up.

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You're now hearing about DME since 1960. Now it's available. Developed by Bendix Electronics. Flight tested. Ready for installation by Bendix Radio. It's the airborne (DME) equipment that accurately measures the distance of a plane from a ground station. All our work with some 300 VOR and ILS ground sites that have been installed in anticipation of the DME development, that had to come in system navigation.

Reduces operating costs

DME is a brand new navigation and safety aid. But even more, it brings possible reduction in operation costs. Cost cuts savings that you can pick up and see. DME/VOR brings savings in fuel consumption... flight time convenience to passengers, better flight control.

Holding at Unmarked points

Holding for the big and congested airports is no longer limited to major interstates, major facilities or airway markers. With Bendix DME, aircraft can now hold at any point within range of a DME/VOR station. Holding patterns can be tighter, closer in, more accurately executed. Holding can now be an actual distance covered, not an elapsed time. No more need for wobbly side-arms "Buffer Zones". Holding away from airway interstates, means less, that through traffic can go by without delay.

Unmarked airways

Most of the level of the executive or corporate type aircraft usually ends up off the beaten path. DME means time and money saved on those flights. Any pilot in a Bendix DME equipped plane, flying within range of a VOR/DME range station can pinpoint his location any time he wants to be on an unmarked route. He can have a continuous geographical fix. With accurate information from the VOR range, and with distance reading information on his DME, the pilot knows his geographical location at all times.

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For, if any, of the fields served infrequently, or not at all by the scheduled airlines, could be approached with VOR alone. Now for the first time, Bendix VOR plus Bendix DME gives pilots both a bearing... and the precise short distance to the minimum let-down

point. Are there obstructions near the airfield? A clearance issued? A single model? The latest may show them. Your Bendix DME/VOR provides a reliable way to determine that the obstacle has been passed on an approach... and that a let-down may be safely started.

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The Bendix DME allows the pilot to estimate arrival times more accurately. Flight tests prove that a pilot with DME on his instrument panel can forget about head winds, tail winds... Irregularities, etc. His ground speed is always right in front of him on the Bendix DME response. As it takes in a little mental arithmetic (like how far did I fly in one minute... two minutes?) Whatever the change... the pilot can adjust his power to maintain his ground ETA. Accurate ETA's reduce holding and holding-changing along the airways. They reduce wasted time expenditures. Save time, money and increase passenger convenience.

Orbiting

Orbiting... regardless of wind conditions, a pilot is now able to fly an accurately controlled circular course. This exact size can be flown around a DME/VOR at selected distances from the station and at varying altitudes.

This expedites departures and arrivals. It bypasses holding stacks at intersections. It all saves time, fuel and money.

And as pilots become more familiar with DME/VOR many other advantages will be developed. Bendix DME is another great step forward in system navigation. For further information, write to Bendix Radio, 2130 North Charles Street, Baltimore, Md.

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TOMORROW'S DAY FIGHTER probably will have delta wing, variable area, lightweight jet, integral construction

More Thrust, Less Weight Are the . . .

Two Paths to Day Fighter Superiority

Getting more power from engines is no important as 'stripping down' plans for better performance.

By David A. Anderson

We are heading for a new cycle in aircraft development with a type designated as the day superiority fighter.

Seen for the first time in the world for an airplane that will outfly and outlast anything the enemy can put up.

Now under development at many of the major aircraft manufacturers in the country, the day superiority fighter is being designed at the plants of Lockheed, North American and Northrop.

Design Preview—Within the next year or so, the preliminary design will have been started and finalized. The next advances in aircraft construction techniques will be coupled with the latest aerodynamic developments and the biggest, most powerful engines to produce the new breed.

How is what they can look like:

• A conventional airplane has the gun battery of four 20-mm cannons in

the nose. Behind the armament and its necessary motor gear/act is the pilot. He may be using an ejection seat, but there is a chance that a ejection capsule of some kind could be built for equal or less weight and provide more protection and safety for the pilot.

• The airplane is built around a delta-wing layout. Two lightweight tubular ribs are slung underneath the wing about halfway out the span. These ribs can be replaced quickly by any maintenance in the field, as better concepts come along, they can be slung on the same sets of fittings and improve the performance of the airplane further.

• Top speed of the craft will be over the speed of sound, as high as Mach 1.5. Sea level rate of climb can be up around 38,000 fpm., and operational ceiling will be above 50,000 ft.

• The construction will be largely of integral panels, made in quantity on the new giant press now beginning to

enter their weight belt in aircraft development.

• For Understanding—Perhaps the first thing to be understood about the term "day superiority" fighter is the meaning of the word "superiority." It has nothing to do with outmaneuvering the six, instead it defines the aerodynamic performance of the airplane.

Genius of the type probably began with the first pilot's reports from combat as MG Alley. It was frustrating for Sabre pilots to be forced into a defensive position to avoid combat at the closing of the canopy. The MG pilot, with a margin of superiority in climb and ceiling, would fight or fire as well, and there was nothing the Sabre pilot could do about it.

To them, MG Alley became a dove, regardless of the superior auto of MG kills run up by the Sabre. You see as six six, and the pilot, by carrying the fight to the enemy, this we need do.

To these early pilot reports was added the insight of opinion from experts like Edward Heintzman of Douglas, who saw its contemporary fighter

explain a trend towards increased cost and complexity which was staggering to watch.

► **Power and Performance—**Pilot in Korea cannot see the performance difference between MG and Sabre in terms of the night difference. Four thousand pounds of aluminum alloy and steel separated a loaded MG from a loaded Sabre. This weight differential, according to the pilots, could be reduced by eliminating some of the fills in the Sabre. Duplication of systems, extra gadgetry, unnecessary load up.

In support of this view, one of Heintzman's concepts—growth factor—has been used by proponents of reduced weight. Heintzman pointed out that every pound of equipment added would add 15 lb. of airplane weight to carry it around. The ratio of ten-to-one was considered as an average for contemporary fighters, although it was noted that the factor could be 15 or 20 for high-performance aircraft.

It is possible to carry the use of the ten-to-one factor, however. It is not an arbitrary number, but an engineering guide. It won't hold as you keep stripping weight out of the airplane.

Take the Sabre as an example. In conservative use of the growth factor would tell you that 500 lb. of equipment out of the Sabre would result in a reduction in gross weight from 16,000 to 5,000 lb. This is not likely.

► **Stripping—**There are lots of things, the pilots said, that can be pulled out of an airplane to make it lighter. Using the Sabre as an example again, the pilots have compiled a long list of unnecessary items. On this list are the self-sealing fuel tanks and armor as being considered an integral part of a fighter.

Duplicate or emergency systems for landing gear extension and for the primary fuel systems could go. So could some operations of the canopy. So could parking brakes.

There, the pilots said, if the airplane could be stripped of that extra equipment, it should be possible to reduce the structural weight required to carry that stuff around. You wouldn't require as much room inside the airplane, and that would mean a smaller enclosed volume for landing gear and wings.

A smaller airplane would also be a lighter weapon. So this kind of thinking has led to the idea of the "stripped-down" fighter for day superiority, an idea that is backed by almost everybody in the F-104. The Korea war fighter in the combat air war in Korea.

The pilots say they want an airplane that will outperform and outlast the MG's superiority. This means performance at the high end of the horsepower spectrum (Mach 1.3 or so) and a battery of cannons. But is additional stripped-down

World War II Light Fighter Designs . . .



ZERO agile World War II fighter (here in U. S. markings) carried two cannons, two machineguns, weighed less than 6,000 lb.



XP-77 Bell powered the XP-77 prototype with Ranger engine, armed it with 20-mm. cannon, two 50-cal. machineguns.



FB-1 Grumman Brewster carried four cannons in rugged airplane that weighed less than 3,000 lb. Engine delivered 2,500 hp.

Fastener Problem



How McCULLOCH MOTORS does a combination strengthening and fastening job

This aluminum alloy, flange-capsule body is part of a direct screw engine assembly from McCulloch Motor Corporation. To strengthen the hole in this casing, and to locate the coil induction assembly, McCulloch uses Rollpin. McCulloch engineers expect that the Rollpin not only retains itself by the tension pressure exerted against the hole walls, but it also serves as a positive reinforcement to the soft metal casing. Single assembly lowers production cost. And Rollpin usually strengthens the casing—it has greater shear strength than solid, mild-carbon-steel pins of same diameter!



Rollpin (left), and steel (right)

If you use dowels, pins, screws or set screws, or if you want to increase the shear strength of a joint—Rollpin can cut your costs, too. Just mail the coupon for design information.



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lighter should also be less complex. Being lighter and less complicated should make it cost less to produce.

The real great of this team of thought is a lightweight fighter which is smaller and cheaper than the 20,000-lb., \$400,000 fighters we are beginning to develop now.

► **Weight Reduction**—It is certainly worthwhile to reduce the weight of an airplane. All other things being equal, if Airplane A weighs less than Airplane B.

- Airplane A will outclimb B.
- Airplane A will turn in a tighter radius than B.
- Airplane A will operate at higher altitudes than B.
- Airplane A and B will have about the same top speed.

There is one factor which is generally overlooked. It takes a lot of weight difference to show up as a noticeable performance difference.

For example, lightening the Sabre by two tons—in other words, making it equal to the MIG in gross weight—would improve the Sabre rate of climb by about 50%. This would correspond to a sea level rate of climb of about 8,500 fpm, still somewhat below the 24,500 fpm of the MIG. And getting two tons out of the Sabre would not be an easy task.

Most designers feel that there is no real profit in a weight reduction program after the airplane has been built, only a profit in the drawing boards.

► **Mass Thin Light Weights**—Not that in itself is the airplane performance picture that induced weight. All the other factors previously do not prove a good deal. Soaking in the Sabre series is an example, the P-50D is a larger and heavier airplane than the F-86A, but its aerodynamic performance is superior. As a fighting airplane, it could be beat by the P-50A, because of the additional avionics gear it carries.

It is easy to overlook the fact that thrust and weight are equally important in the equation which describe the kind of performance that makes a superior fighter.

That pursuing pounds through the engine is important, but not all important. What you want is more thrust as well as less weight.

Perhaps a better way to look at it is to consider that a very important parameter for comparing fighter airplanes is the ratio of thrust to weight.

The higher the ratio, the higher will be the airplane's rate of climb, the higher its ceiling, and the smaller its radius of turn.

For the contemporary Sabre, thrust-weight ratio is about 3.11 at takeoff, rising to about 0.40 at combat weights. For the MIG, the ratio is about 0.5 or a little better. (If the ratio reaches 0.6



Only the Beginning...

In the 25 years that Eastern has been in business we have carried 21,841,534 passengers. Perhaps you were one of these passengers.

I am deeply glad as I think back to Eastern's humble beginning. In 1938 we pioneered flying the route between New York and Atlanta, a distance of only 360 route miles. It has taken many, many years of hard work, trial and error to bring Eastern to the system as today.

From that beginning we have expanded to 31 key cities, covering 13,740 route miles. During the past year alone we carried 4,327,357 passengers over two billion passenger miles.

Eastern's fleet has grown from its original 31 airplanes to more than 1,050, all expertly trained to serve you.

It does not seem fair that we have contributed so our growth, we feel it has been the dependable record and experience of our personnel and equipment together with one of the finest aircraft maintenance organizations in the world.

You can be assured Eastern's personnel is that equally dependable. Through the years we have made a practice to select our personnel who we great care. We know one of the most comfortable flying programs in the industry. Many of these who have worked with us today to twenty five years ago are still with us today, holding key positions. We are proud of the record.

In the selection of our airplanes we spend years in studying and testing the finest aircraft available. This and performance have proved that our Super-Constellation, new Type Constellation and Silver Palomares are the most advanced and dependable airplanes in the world.

Dependable airplanes and dependable personnel have given Eastern a world-wide reputation for

Double Dependability

To uphold this reputation, we have established the finest maintenance base in the country, equipped with the best tools money can buy. Our airplanes are particularly given complete overhaul. Every single part is serviced in utmost detail to make the airplane even better than new when it emerges from our shops, ready for service.

Looking to the Future

In the business of air transportation you must always look to the future. Ideas that were thought to be impossible yesterday may be obsolete tomorrow. Within the next few years we will make many technical advances that we have in the past. For example, while we have no jetliners, possibly some, many airlines will be using jet engines routinely. We will then be able to fly between New York and Miami in 3 1/2 hours.

For local schedule operation, if profit it will be using turbojets, capable of flying faster than 200 mph.

The next big step up in speed after jet will probably come within the lifetime of most of us. When, God willing, we will fly on atomic fuel, high above the stratosphere at speeds that almost defy the imagination.

I am sure that whatever it is, over the air transportation, Eastern, as it has in the past, will offer you the finest, the best and the most dependable carrier that your money can buy.

Sincerely,


E. J. Rickert
President and General Manager

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AVIATION PROGRESS MARRIED—Here at Kitty Hawk, N. C., the aviators would someday find tribute to the Wright Brothers for their achievement of powered flight

in a heavier-than-air machine in 1903 And among the aviation pioneers taking part was Igor Sikorsky, whose aircraft have made a major contribution to air progress.

AROUND THE WORLD WITH THE FLYING JACK-OF-ALL-TRADES



ROTARY-WINGED PACK TRAIN—Airlift of vital construction materials, key personnel, and survey teams is routine on the Alaskan Company of Canada's vast road-building and power development project in the rugged Kluane region of British Columbia. In a few hours big Sikorsky HO4S-1s, operated by Ottawa's Helicopters, Ltd., can load loads which trains would need days to deliver.



EASY DOES IT—A big H-19 Sikorsky eases wounded men gently to the lava in front of the Naval Medical Center in Bethesda, Maryland, making a steady flight which lands on the battlefield. Regular transfer of Korea casualties arriving at new military air terminals in the U. S. direct to surgical hospitals is planned by the Military Air Transport Service.



"KEY PRO"—Ministering to the spiritual needs of men at sea is often difficult because of rough seas and the distance between ships in a fleet. But with helicopters such as the Sikorsky HO4S-1 shown above, chaplains can move from ship to ship with ease and come aboard by landing or by rescue hoist.



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or better, vertical shock and shock is possible.)

► **Power Base**—Examination of this ratio suggests that boosting the thrust of the Solar as any other contemporary fighter would improve the T-7W ratio and thus make it a better MIG-matcher. In theory this works out well, but in practice, the huge thrusts needed can't be achieved by the usual schemes of liquid injection or afterburning.

So it is possible to conclude that stripping a Solar of weight and boosting the thrust would improve the performance somewhat, but not by enough of a margin to give it a clear edge over the MIG.

The same philosophy holds for any of the newer fighters you can't take a Solar as a Striker or a Thunderbolt and stop it down with our first effectiveness.

The best way to develop a fighter with a high thrust-weight ratio is to start from scratch with some new concepts. The basic fighter facts of life are few. You need a gun battery with an effective lighting system, an instrument to house the battery and pilot, and a powerful engine to get the work to the canopy. Everything else goes along to correct the functions of one or the other of these parts.

► **What Has Been Done**—These primary needs have been known for years now, and have been paralleled into some very interesting layouts in the past. Probably the lightest fighting machine ever built was the little British Gloster Kitty, a World War I fighter which weighed in at 515 lb. guns with enough fuel for three hours and a Lewis gun in battery.

More recently the Germans tackled the problem in their last-ditch Heinkel 162 "Volfssturm" (People's Fighter) a scaled-down-and-scaled-up sword with performance equal to the jet fighters of the immediate postwar years.

Currently entering flight test in England is the P-530 Gnat, a creation of W. E. W. Petter, master of the English Electric Canberra. The Gnat is expected to weigh in under 1,000 lb.

In this country, Lockheed, Northrop, North American, Douglas and Grumman have been reported to working on fighters in the stripped-down category.

► **The Big Seven**—In all these designs, the necessity of the structural demands and aerodynamicity will come in conflict unless the engine manufacturer can come through. With the engine representing the biggest single chunk of weight in a current layout and, of course, providing the only thrust, the paramount worry of every designer is it going to be in jet or engine or some combination thrust-weight ratio.

Right now, such engines are not in quantity production in this country



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cylinder "Jet engine" makes
Utica's methods and facilities
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now totally equipped in jet
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We show you this picture of the Lockheed Constellation this way — to illustrate to you what Rohr is famous for: Building power packages — power packages for the Lockheed Constellation and other world-famous commercial and military planes. Of course, the Rohr aircraftmen do more than this. Currently they are producing more than 25,000 different parts for all types of airplanes.

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or altered. Our engineers are working around a rate of two in three. The latest Kolls-Royer Avion is just a few weeks off, the highest rate of any subject known to us at this writing.

According to one top engine company executive, there is no military requirement for such an engine. He finds in developing such a prototype on this scale, he said, and he is confident that other engine manufacturers are doing the same.

So it appears as if the engine and release designers can only start from the legacy and at the same level for these new fittings.

Wide Peace Use Seen For Earth Satellite

The military adoption of an artificial satellite has been greatly accelerated, says Henry Ross, member of the British Interplanetary Society.

Speaking before the Midlands Branch of the BIS recently, Ross said that if it were possible to gain a satellite vehicle into an orbit, it would be possible to shoot it down just as easily.

But there are many and varied peaceful uses for such a satellite, Ross said. There is time he detailed them.

► **Fuse Small Satellites**—In the appropriate future, small instrument-carrying vehicles are likely to be developed. Perhaps the first would carry only a satellite balloon, and go to show it, say, that it would not be a substitute for radio waves. Such a device could be valuable for investigating the propagation of radio waves.

The next step would seem to be a larger vehicle—perhaps twice the size of the Gossamer V-2—which could carry a useful payload of about 50 lb. of instruments into an orbit several hundred miles up. At a height of 500 miles, the artificial satellite would have a velocity of 4.66 miles per second and would circle the earth once every 100 minutes. Data on cosmic rays, solar radiation, and similar measurements could be transmitted back to earth as long as power was available.

The next step would be the provision of electrical energy from the sun, either by a conventional sun mirror-solar-batter system or, more probably, by means of a mirror and thermocouple.

► **Kolls Stations**—At an orbital height of 22,500 miles, with an orbital velocity of 1.9 miles per second, the satellite period would be equal to that of the earth. Any vehicle in this orbit, assuming a west-to-east movement, would appear stationary to a ground observer. Three of these satellites suitably situated could act as television relay stations and would be sufficient to cover the whole globe.

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PERDUE 20, MICHIGAN

would bear its transmission to one of the satellites which would re-transmit it back over a wide angle. Power required for the re-transmission would be remarkably low, depending on the size of 1:2 lobes at its own station, and flow.

Television relay stations could be set up before manned space flight is possible, but the nature of current equipment means that breakdowns would be certain to occur. It is possible to build up space circuits with automatic switching in case of a fail, but this method could not be expanded indefinitely and some or less saving or replacement of equipment would be essential.

This conclusion leads to the next step—a manned satellite. Such a station could act as a television and short-wave radio link as well as a search laboratory.

► **Unique Properties**—A satellite has unique properties among man-made laboratories. For example, the sea state of the full tide is relevant on a satellite. Open space is almost a perfect vacuum and many experiments requiring exceptionally high vacuums could be attempted.

As astronomical and astronomical observatories, these manned stations could prove very useful. Clock work could be kept on the world's watches and many would make accurate observations of our long term forecasts to be made.

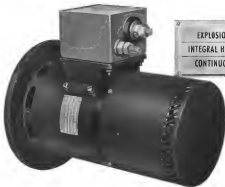
The atmosphere of the earth has always been a major obstacle to astronomy, and even earth telescopes set up on a satellite would prove exceptionally useful. Many of the details of the moon and the planets could be studied in such a laboratory—John Thompson.

Broader Education Urged for Engineers

Engineering education needs to be expanded into liberal arts and the humanities, said Lillian G. Mead, president of the Society of Women Engineers at its 1953 National Convention held recently in New York.

"This great faculty of people that gets the narrow branches of the mechanical," said Miss Mead, "should be given a concrete basis of education and a broader field of vision before they are permitted to enter some field respective science and operations on the part of an untrained mental part of the overall field."

Miss Mead urged educational leaders in colleges and universities to take careful steps of the lack of understanding caused by education of engineering from the arts and humanities. Engineering and other professions must be able



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Ryan activities today blanket the field of aircraft and aeronautical product development and production. From the manufacture of airplane components and high speed piston jet planes... to electronic research and development... to executive-liftman airplanes and jet propulsion research, Ryan is helping to strengthen America's air-arm.

THESE GREAT WORKS THING for Boeing's L-1011 Stratojet—the largest jet put into production—on an example of Ryan leadership. Each of these huge birds, comparable in size to the fuselage of the Stratojet, requires over 30,000 aircraft parts with and also advanced production techniques developed by Ryan.

RYAN'S-17 MILITARY DESIGN NAVIGATOR has won extensive acclaim around the world. They have received high praise for their excellent flying characteristics, efficiency in operating from short, rough fields, and proved ability in high temperature climates and at high altitudes.



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to make themselves understood to allow for a greater variety of support.

"We used this feature, and the place where we would actually find it would be under the guidance of our structural instructions," Mrs. Ward concluded.

Jet Tips Make Helicopters Safer

Dramatic proof of the safety of a jet-propelled helicopter, due to stored kinetic energy in its rotor, has been furnished recently by an accident involving the helicopter Aéro III, according to a report by Sicaud, the French aircraft manufacturer.

During takeoff for a flight test, the circulation direction of the tip of the blade suddenly reversed operation. The jet helicopter was then at an altitude of approximately 60 ft and flying at a low forward speed—a critical region for a jet-propelled helicopter, Sicaud says.

But the pilot was able to get the aircraft into autorotation without any change in rotor rpm, and to reach the ground without incident. Incidentally after impact, the front wheel of the cyclic landing gear became caught in a deep rut and tipped the fuselage about 30 deg. The rotor blade tip damaged the tail of the rotor, but the tips of the metal rotor blades were undamaged.

Sicaud says this accident has proven the safety features of the aircraft and the high resistance of its rotor blades. The firm contends that a conventional helicopter in a similar accident would have been completely destroyed.

Flight Safety School Started by Air Force

A new flight safety education program for M2 Air Force officers has begun at the University of Southern California, Los Angeles, and is expected to pay off in equaling latest safety operational techniques throughout the Air Force.

The first class of 23 officers began an intensive course in aeronautical engineering, aviation physiology and psychology aimed at aircraft accident prevention, and investigative procedures. Successful classes will follow at six week intervals for these years and M2 flight safety officers have been trained at the school.

Special Safety-Crews national was contributed by the Air Force, aviation manufacturing industry, commercial airlines, Civil Aeronautics Administration, Civil Aeronautics Board, Flight Safety Foundation, and other safety research agencies.

The officer students are expected and

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Valve Talk

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By Marvin Mills,
Sales Manager, Another Writer Again



"Talks easily"... what does it mean? How does it apply to you and your family in this chaotic era of war and peace?

Most of us are too busy or too tolerant to keep ourselves informed on the critical need for a dual defense front against the Soviet threat and Communism at home.

The Reds know our families only too well. They take quick advantage of them at every turn. They even go so far as to abet those families when they hide behind the Constitution to the end that they can destroy it.

Just as we read the headlines, listen to the radio reports, watch on television as the Communists digger deeper year by year, we are often too busy to do anything about it. There, because we are so busy, we turn to the sports page, switch to dance music on a TV console without adding up the score.

From a moment over a map and figure the message from the news. The news is too far to let someone else do the worrying and the weep. Unfortunately too many other Americans share our lethargy.

We all know it can happen. Who, then, are we speaking? Better we listen to the words of best resistance, because it is too easy to let someone else do the worrying and the weep. Unfortunately too many other Americans share our lethargy.

We seem to have a healthy fear of anything that means action without feeling that it is the great or the best. We live on an American plane that is run by a Red fighter over Western Germany, but we seem to have the courage actually with other planes flying or moving in strange spaces.

We live of some plan, some document, and some party support and we seem to have a healthy fear of anything that means action without feeling that it is the great or the best. We live on an American plane that is run by a Red fighter over Western Germany, but we seem to have the courage actually with other planes flying or moving in strange spaces.

I speak here not of the military, nor of education, but of the work and life of us. Fortunately, there are some in the nation—the air and the sea—who are not apathetic. Even though they have been denied or have been by a rigid line, they are the strength that backs up our weakness.

Take the Ground Observer Corps, an activity as simple as the gaps in our radar screen. To the fact that thousands of men untrained or untrained... a crying need for thousands of volunteers for a few hours each week. If we fail to do the need, who then do we blame if a returned bomber slips through low under our electronic fence?

But what do most of us do about these things? Nothing!

We permit the Communist Party to exist, knowing that every member is an agent to cause the Soviet program of domestic destruction... a party, which our work with cells that meet in secret meetings, requiring sophisticated obstacles to activity as the Kremlin.

In our eagerness to prevent our own freedom we even defend those who would destroy us as they hide behind the Constitution. Somehow we forget that a government's first obligation is to preserve itself. Only then can it preserve freedom.

An Air Force Helicopter pilot, the man who lives on our "F-101" in a crowded theater crowd denied by action on the ground of a government right to say the occurrence actually with other planes flying or moving in strange spaces.

Unfortunately the message of the message the F-101, the Communist, are not as dramatic as that example. We are just ignored them... and we are in addition to the Red schedule Korea who, which seems most step at a moment's notice, we are at a struggle on two fronts, whether we know it or not. We must put muscle on our chin. At the same time, we must close our country to the masses who resist it.

Understanding, let us not be apathetic, responsible to do it. But we need we think of our greatest weakness—public apathy.

Think about it.



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NOTE: Other sizes made to customer's specifications. See Ask Sales Office for technical data.

Write for the Book on Riveting This Way



major, who will serve in many as public speaking and group education methods as they can spread their knowledge an operational level when they return to their base.

Three of the teams were led down by Maj Gen Victor Strickland, deputy inspector general USAF, and Brig Gen. Richard J. O'Keefe, director of flight safety research. Lt Col Laurence H. Maccubbin, of the Directorate of Flight Safety Research, is representing the contest. **Class and Effect**—Lecture courses on fires and effects of aerodynamic forces in accidents, inspection methods, structural and materials problems, and the human factor in crashes will be supplemented by laboratory experience with the aircraft's human cockpit, which simulates g-forces encountered in high speed flight.

Three-Way Camera Records Scope Data

A new recording camera designed to provide a permanent record of transient, low repetitive phenomena displayed on a cathode ray oscilloscope has been an-

nounced by J. A. Mauer, Inc. The camera provides three different modes of operation—single exposure, continuous moving film, or revolving drum-type photography—and is easily changed from one mode to another, Mauer says. In the moving film mode, the camera holds up to 25 ft of film and provides a choice of film speeds between 9.4 and 100 ft/sec. Flat drum photography, a 50-lb. capacity magazine provides 20-ft. film lengths cut to size with a built-in loader, permitting 25 runs without re-loading. Drum speeds can be varied between 4 and 1,200 ft/sec.

The camera uses 35 or 30 mm film or photo-sensitive paper, either perforated or unperforated. Internal electrical contacts are provided for oscilloscope beam suppression during dark cycle runs and the drum can be synchronized with an external event. Camera is equipped with a 1/16 f/3.9 lens as standard equipment with other lenses available if desired. The camera is built by Southern Instruments Ltd., of Surrey, England.

J. A. Mauer, Inc., Photographic Instruments Div., 3701 11th St., Long Beach City 1, N. Y.



McDonnell Opens Jet Test Facility

New jet powerplants for helicopters under development at McDonnell Aircraft Corp. are currently assembled for test runs in the new McDonnell propulsion test laboratory at St. Louis.

Two test chambers in the laboratory will be able to simulate flight conditions for jet propulsion tests as well as other types of jet engine, turbojet and ramjet. A 5,000-hp electric motor drives two compressor to provide the required airflow.

Soundproofing has gone in for special attention in the construction of the laboratory. Two-cell walls are made of 12 in. of reinforced concrete and 4 in. of soundproof insulation plus a soundproof laboratory construction in the second chamber.

The heating passages of the McDonnell between the concrete wall permit exhaust and stress from the jets to escape outside while the area is re-

tained inside. McDonnell says that a person standing at the top of the large jet exit end of the laboratory can't be heard by another person 25 ft away. "Fading out" construction—probably similar to the General Electric jet laboratory at Eindhoven—is used for the two control rooms to keep engine noise and vibrations to a minimum.

The two compressors were specifically designed for development tests. One delivers air at high pressure and low mass flow, the other will deliver a 13-in. diameter jet at mass-airflow values. The air supply can be used for rocket development, variable-thrust, and small wind-tunnel work.

The cost of the laboratory was \$8.2 million, of which \$694,900 went for the compressors. Architects and consulting engineers for the project are Sweeney and Perrell St. Louis, building was Thru-A-Closure Contracting Co.

No ordinary relay...This! New CLARE Type T

High Frequency Impulse Relay will follow 2500 cycles per second with life measured in billions of operations!



View of Clare Type T High Frequency Impulse Relay with dust cover removed



External view of relay ready for mounting

specifications . . .

MECHANICAL

- SIZE:** 1.075" diameter x 1 1/8" height.
- WEIGHT:** 8 grams.
- MOUNTING:** Equipped with silver plated contact pins, in 90° standard 3 pin axial mount. Resonance damped (1/2 watt).
- COVER:** Removable dust cap.
- CONTACTS:**
 - Type: None A Input - normally open
 - Material: 95% Silver Indium
 - Finish: 90000 lbf
 - Pressure: 30 grams, min. 1500 applied with 50 microampere.
- COIL:**
 - Type: Single winding, braided-wound
 - Waves: Square waves

ELECTRICAL

- COIL SUPPLY VOLTAGE:** 0-5 volt (external load)
- CONTACT CURRENT:** 0.05 amp, max. 100 with 50 ohm inductive load (external)
- CONTACT ROUNDNESS:** None

OPERATION

- DRIVE:** Pull in - 15 microampere
- DRIVE:** Drop out - 12 microampere
- Pull in current:** 130 microampere
- Drop out current:** 100 microampere
- RATE:** With 1000 cycles per second, operates in 1000 cycles per second.
- USE EXPECTANCY:** 5 x 10⁹ operations with one contact current.
- RELUCTANCE SWITCHING:** 100 volt, min.

TYPICAL APPLICATIONS

- Gas Ionization - 0.2 by (vacuum speed)
- Cell Ionization - 0.2 by (vacuum speed)
- Cell Ionization - 120 ohms
- Pull in current - 10 to 12 ma
- Drop out current - 6 to 10 ma
- Normal coil current - 40 ma
- Contact current - 0.05 ma

USE EXPECTANCY: Following a 1 x 10⁹ operation rate period, a life of 1 x 10⁹ operations with a 0.05 amp contact load over a 1000000 period without degradation.

Originally designed for use in an analog computer, the new Clare Type T High Frequency Impulse Relay is now available for other applications which require a highly sensitive relay completely free from contact bounce and capable of a prodigious number of operations at extremely high speeds.

Its pull-in time of 120 microseconds and drop-out time of 100 microseconds enable this relay to follow up to 2500 cycles per second, equivalent to 3000 cycles per second.

In a typical application, it has a life expectancy, following a two-in period of 1 x 10⁹ operations, of 1 x 10⁹ operations with a 90 ma contact load over a 10-month period without replacement.

To achieve its high speed, no-bounce, and other unusual characteristics, this relay is built to extremely close tolerances, with a high degree of precision, under conditions of utmost cleanliness. This accelerated development of techniques never before employed in the manufacture of relays.

Even before this new public announcement of the availability of this truly available relay, its fame has spread. Already, dozens of inquiries and sample orders have been received from laboratories and development organizations which had learned of its existence through the manufacturers who first applied it as a self-known company. It may provide the answer to one of your problems.

For full information on this new relay, or for consultation on any relay problem, we invite you to contact your nearest CLARE sales representative or write to C. P. Clare & Co., 4719 West Broadway Avenue, Chicago 34, Illinois. In Canada: Canadian Fire Materials Ltd., Toronto 14, Ontario. Cable address: CLARETEL.

WRITE FOR BULLETIN 227

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The Sikorsky HO4S Helicopter

Sikorsky, an illustrious name in aviation, gains added lustre as reports of unprecedented rescue operations come to us from the Korean battlefield. Electrol, by aiding in the development of hydraulic installations of specialized design, contributes in some measure to the great service these "flying windmills" perform in the saving of precious human lives.

British Raising Jet Transport Production

Production rates on the new British turboprop and turbojet transport aircraft may be the deciding factor in the capture of a faster world market, say some observers.

British manufacturers have resorted to extensive subcontracting in order to expand their production. Some of the new capacity so acquired is being used to build complete aircraft, some for making major components, such as wings, and the remainder for making small parts.

Staff Assessment-In recent several visits to Great Britain, Aviation Week's staff members have been able to assess British production and methods. As a generalization, it is possible to say that the British use the same methods as do American manufacturers, but on a smaller scale.

There were three major deterrents to large-scale British aircraft production in the early postwar years: manpower, housing, and machinery. In recent months, most of the machine tools ordered during the first years of the postwar expansion have been delivered, efforts have been postulated from European countries and the U. S.

The shortage of manpower and housing continues, however.

How is a standup of the current status of British transport production and subcontracting?

► **DH Company**-The world's first turboprop transport in service has been in production for several years at the Hatfield plant of the de Havilland enterprise; now two more lines are being developed. The first of these is at the Short Bros and Harland factory at Belfast, Ireland and the second is at DH's Chester plant, the largest aircraft production factory in England.

The Chester line was begun four



I don't know what it is... let's get out of here!

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Precision and skill in the fabrication of components and assemblies helping America's jets deliver the world's highest

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Exclusive swivel action lock and easy wrap-around
wedges speed up take and dust assembly...
Removal for servicing is effortless in seconds...
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months ago, and currently all jigs and
fixtures are down and work has started on
the first Comet II nacelle. Wing
jigs are almost complete. This factory's
first Comet III will be flying early in
1954, which is also the colored right
side of the first Short built Comet.

Horizontal tail surfaces for the
Comet are being built by Ford and
Douglas, and other small
components are being produced at
De Havilland's Aircraft Division at Christ-
church and Portsmouth.

► **Victory Viscount**—The turbo-prop
motors, now in full production at the
Victory home factory at Weybridge, has
recently entered service with British
European Airways.

Trotting for Viscount production has
begun at Victory's plant at Here, and
the first aircraft to be built there will
fly next year. An increase in production
of Here is expected to take some of the
load off the line at Weybridge, making
the latter available for other work. Here
expects to be producing 300 Viscounts
per year by the fall of 1955.

Standard-Bac is building wings and
engine nacelles for the Viscounts, after
company have been called in to build
horizontal tails, the fus and possible
control surfaces.

► **Iceland Billions**—Production of the
turbo-prop Betwain will be commen-
ced at Bristol's factory, but slight
modifications will be called for if produc-
tion is to expand. Bristol expects to
reach 25 planes a year as soon as possible
and another Bristol company may later
be called in to set up a second
line.

There are also plans for produc-
tion of the Betwain in Canada (*Aviation
Week Mar. 25, p. 27*).

**Remote Indicator Aids
Aviation Test Work**

Fisher & Porter has developed a re-
mote indicator test reaction test work,
to provide greater scale length and re-
duce scaling accuracy.

The device, primarily designed for
use with the firm's 54-035, Summitt
and Rotomatic electronic data trans-
mission system, uses a 15-mil strip
scale which moves behind a fixed hori-
zontal spacer between the file and re-
sponse is so small that profiles are virtually
eliminated, the company says.

The electronic scale provides a read-
ing accuracy of better than one part
in 2,000 when scale divisions are 1 in-
ches. The indicator can be adapted to
any precision instrument, the firm be-
lieves. It can be located up to 2,000
feet from the flowmeter with no loss in
accuracy.

Fisher & Porter Co., 16 Jacksonville
Bl., Hoboken, Pa.



"A plane is a collection of aluminum
holes held together by rivets," so aer-
onaut designers once said jokingly in cre-
dulously the importance of rivets in
aircraft construction. The rivets are
solid rivets which are drilled and banded
by conventional methods. But a steel
nacelle are actually precision parts,
such as Cherry Head Rivets, of which
as many as 250,000 are used in one
super-bomber—60,000 in a smaller
fighter or transport.

These precision fasteners are set
quickly and easily by one man from one

side of the work with a special tool that
pulls the rivet tightly into place without
backing hammering or exploding. Head
rivets are virtually indispensable to
modern plane construction as they en-
able rivet joints in difficult-to-
reach places, thus permitting freedom
of design not possible with other types
of fasteners. This feature also enables
manufacturers to cut out costs and
speed production.

Townsend's Cherry Head Rivets are
made in Anaheim, California. It is
dedicated to the production and perfection
of the single product line, highly tested
precision using Townsend design and
built equipment through their ad-
vance to the manufacturers of these
precision rivets which are attached and



rated against an elaborate set of speci-
fications in order to give the excellent
performance required. The greater
portion of Cherry Head Rivet production
goes into military aircraft and will con-
tinue to do so as long as the nation's
aircraft needs remain critical.

Cherry Head Rivets are only one of
some 50,000 different types, sizes and
kinds of Townsend fastening devices
produced at its several plants. With all
these items at their command, Town-
send engineers are able to give you a
suggested solution—help select or design the
fastener best suited for your product or
assembly conditions. A folder describing
Townsend fasteners which are used to
increase efficiency and improve prod-
ucts is yours for the asking.



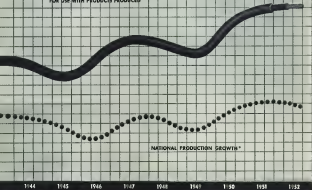
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one—(10) one parts—Cherry Head Rivets—Inland Empire—Self Support one—(10) one one—(10) one one—(10) one one
Phone: New Brighton, Acapulco—Chicago, Ill.—Ann Arbor, Michigan—Santa Ana, California

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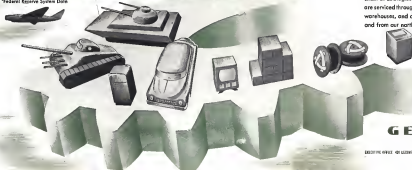
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FOR USE WITH PRODUCTS PRODUCED



NATIONAL PRODUCTION GROWTH*

1944 1945 1946 1947 1948 1949 1950 1951 1952

*Federal Reserve System Data



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PRODUCTION



AIRCRAFT INDUSTRY representatives get look at new lightwood milling machine.

Fast Miller Gives Fine Finish

Machine is tailored to aircraft production, puts cutting of non-ferrous metal parts into high gear.

One of the latest machines specially tailored to meet production requirements recently was demonstrated at Cleveland's Vultee Aircraft Corp's 17, 17th Street Division on the occasion of the successful setting of the Aircraft Industries Assn.'s manufacturing methods committee today.

Representatives of the National Tool Builders Assn. and other interested groups also attended the showing, which was sponsored by the Air Materials Command's Industrial Services Branch, Production and Resources Division.

The machine—a lightwood version miller—cuts cutting of non-ferrous metals in high gear. It was built by Cincinnati Milling Machine Co. under an Air Force contract after an extensive survey of aircraft industry requirements. Air Force prime interest in the development was to find a way of cutting cutting costs.

While exact milling machines are reported by Corvair to reach maximum capacity at about 1,500 rpm, Cincinnati's new mill starts at five speed, can run accurately to 11,700 rpm. Table travel speeds of 375 in./min. are as reported for the new tool, combining with 60 in./min. speeds of standard millers.

Finish on metal cut on the tool is extraordinarily smooth. Information is that the machine will give a finish of

0.00005 in. (90000).
 Industry Saved—Under the contract, some of the principal aircraft plants were surveyed to determine what type of milling machine would be best suited to present and future needs for the aircraft industry.

Survey questions, it is reported, were designed to indicate whether the mill should be vertical, horizontal, position or tool-room type, the general work to be performed, spindle speed and horsepower, feed rates, sizes and types of cutters generally used, table travel lengths, available gear ranges, and other specifications.

Plants surveyed included Boeing, Chance Vought, Convair, Douglas, Goodrich, Lockheed, McDonnell, Martin, Northrop, North American and Republic.

Speed—Based on the survey, the machine evolved in a vertical type production miller with an 18-in. wide table having a travel of 45 in. Its specifications show a table feed of 0 to 375 in./min. (heavy shreds 0 to 300 pph), table travel of 400 in./min. (heavy, 300 pph), spindle speeds and horsepower of 1,500 rpm at 11 hp, 3,800 rpm at 28 hp, up to 5,100 rpm at 30 hp for 6-in. diameter cutters, up to 7,300 rpm at 45 hp for 6-in. cutters, up to at least 10,700 rpm at 93 hp for 4 in. and smaller cutters, from 10,000 (rpm) vertical stage of

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Tapeo Plant, Thompson Products, Inc. uses Kodagraph Autopositive intermediates in print production.



The Tapeo Plant knows full well that flexible step prints pave the way for costly reading errors, know, too, that Kodagraph Autopositive intermediates are low cost insurance against such a possibility.

It flexes its reproduction as more critical and complex job and vice drawings in Kodagraph Autopositive Paper Translucent and thus obtains—quickly and easily—spotting "markers" for pre-making which have dense photographic black base as an easy treatment, pressure-quality paper base, which will produce highly legible whiteprints time after time in stepped-up machine speed.

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No negative step... no distance handling. Kodagraph Autopositive Paper and Film are handled in exactly the same manner... produce positive photographic intermediates directly. They are exposed in one of the Tapeo Plant's direct positive machines—or in a photostat unit. Then, they receive the standard photographic processing. A fast, automatic room-light operation of the step. And no time equipment needed.



Autopositive intermediates save creative drafting time. Tapeo Plant makes necessary changes in the bank, design without delay involving the 113 Kodagraph Autopositive prints of the original drawing. (21) ensuring the requested detail from the Autopositive reproduction with redrawing film. Then, the draftsmen can only to add the new detail... and a print-making station is ready. One which will produce highly legible prints without containing "ghost" images in the replicated area.



Autopositive redaction "user's wishes." Many old drawings that have lost the density or are faded or torn, are transformed into print-making masters by reproducing them on Autopositive Paper or Film. Minor and gross errors are eliminated... work detail to make sure a highly-reading format of redrawing. Autopositive Paper is also used to duplicate a variety of office records, non-transfer vendor cards, etc.

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ENGINEER

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GARLAND, TEXAS

2 in. maximum and 22 in. maximum, cone range with specific vertical of 34 in. (curve showed 25 in.), cone range with specific avoided, 25 in.

Specific lead avoids 45 deg. on either side of vertical axis. These are special safety features, including power adjustment of the cone lead, and a servo-driven clamp-actuator system. Specific low water-cooled bearings and oil lubrication.

► **Benefits**—Benefits reported by Grumman for the highest accuracy of non-ferrous parts include a production increase up to five times, with proper tooling; lead ranging from 5 to 20 micro-inches, depending on the type of material; specific forms, cones of matter, and proper tooling; high degree of accuracy on the work—making re-prize fixtures, etc. possible; less work scrapage due to rapid dissipation of heat through the chips.

► **Contra's Experience**—Contra has been given the responsibility for erecting and evaluating the machine's use on non-ferrous metals. The company also was awarded by the Air Force to produce optimum cutter and fixture designs for use on the mill.

Contra has emphasized a high degree of accuracy with the machine or less than 10 microns, to B. G. Reed, assistant division manager. He reports that B-36 parts have been milled to a degree of finish and fitness never attained with conventional milling machines. —*Irving Stone*

PRODUCTION BRIEFING

► **Fairchild Aircraft Division**, Fairchild Engine & Airplane Corp., Hagerstown, Md., has received a substantial order from Boeing/Seattle for a substantial quantity of B-52 turbine-bearing casing wear, ground and vertical fits. This is in addition to previous B-52 casings. It does not select Fairchild's present C-119 Tacket production.

► **Lambly, Inc.**, 494 W. Superior St., Chicago, has received a Navy contract for more than 50,000 worth of its own engine analysis. Included are its analysis and maintenance of the device and training of Navy crew.

► **Staley Aviation Corp.**, Dallas, N. Y., plans to build a \$100,000 bench factory on a low cost site on or near Dallas to produce engine parts for Boeing B-47 Stratofortress and North American FJ-3 fighters. The factory is scheduled to employ 200 persons in its first year of operation.

► **Kansas Aircraft Corp.**, Bradley Field, Windsor Locks, Conn., has leased 20,000 sq. ft. of factory space in Suffield,

ICE-FREE FUEL FOR THE BOEING STRATOJET...

Even at high altitudes and sub-zero temperatures, the possibility of water moisture freezing on fuel filter screens or probes aboard the Boeing B-47. Equipped with a Lear-Romec Pump and Regulator, each of ten six engine inlets is automatically supplied with alcohol. The paraffin being removed is unconcerned flow of fuel.

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MODEL B-47D-C ALCOHOL PUMP—
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operates at 100 psi. 300 gph. maximum at 30 psi. powered
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Coors, to handle expanded output production, including the new two-beam BKIC. Since 1961 more will be completed at this plant, scheduled for occupancy this month.

▶ **Alpha Tool & Supply Co., Clinton, N. J.**, has expanded its distribution of precision-machined British standard products to include Canada and Mexico.

▶ **Jak & Hazen, Inc., Cleveland**, received nearly \$300,000 in orders for its aircraft accessories during the period Mar. 1-Mar. 15. Two USAF orders totaled more than \$60,000 and orders from Boeing and Douglas came to more than \$15,000. Present J&H backlog is approximately \$50 million.

▶ **Pacific Aerospace Corp., Chino (Calif.) Branch**, has started maintenance and repair work on commercial aircraft with four projects involving 6,000 hr. major overhaul of a Pacific Northern DC-4.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robison Ave., Philadelphia 11.

Beatty Aviation Corp., Seattle Products (Rm. 110, Seattle Center South Tower, 3rd floor) and subsidiary units, for various aircraft, \$119,722.

United Aircraft Corp., Chicago Turbine Div., P. O. Box 5971, Dallas, Texas, and a field office, for various aircraft, \$1,085,184.

Raytheon Aircraft Co., Philadelphia 709, 4, Lane 4, Philadelphia, Pa. 6, \$1,085,184.

Harvard-Walker Corp., South West Div., 2511 Center St., Indianapolis 7, \$101,000.

Keith Manufacturing Co., 1822 W. 72nd St., Tulsa, Ok., maintenance repair for various aircraft, \$12,200.

Brigham Aircraft Co., Inc., 2001 Omaha 2776 West 26th Street, Lincoln, Neb., overhaul work on work order 25 no. 212,885, parts replacement for 2001 Omaha, 20,474, 4292 work order 11 no. 214,221.

Avco Avconics Inc., 115 E. Third St., Burlington 1, Vermont, \$21,012.

American South Corp., 1014 16th St., Burlington 1, Vermont, overhaul work on P-51A-1A, 21,012, overhaul 201 no. 254,700.

Balloune Products Co., 4710 Colburne street-Lansing 10, Sp. Division, overhaul work on work order 21 no. 212,885, parts replacement for 2001 Omaha, 20,474, 4292 work order 11 no. 214,221.

Verlone Inc., 1025 Delaware St., Detroit 2, Michigan, overhaul, \$25,212.

Stamatac Manufacturing Inc., 200 West 21st Street St. Marys Pa., 21,012.

Omaha Div., 1145 Omaha St., Omaha, N. D., work, overhaul, part procurement, the highest no. 214,124.

Patrick Electric Mfg. General Motors Corp., 305 Hill Street St. 12, Wrentham, Ohio, make repair 215,241.

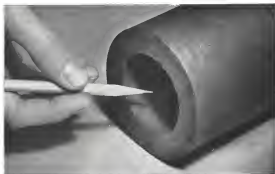
Kearney Aero-Lite Co., 1215, Champaign St., Toledo 2, Ohio, overhaul 212,010.

Bever Products Aircraft Service Corp., Dept. 0526, overhaul, part no. overhaul, overhaul, 201 no. 214,221.

Wright Manufacturing Div. (Curtis-Wright Corp.), Woodbridge N. J., overhaul work order 20 no. 212,885, \$12,012.

W. Stone Armstrong, Tulsa, Ok., 201 E. First Ave., East Tulsa, Ok., parts, 21 010, \$21,212.

Kearney Manufacturing Div., Detroit 2, Ok.



If you make hollow parts, here's where you can save steel and machining time

THE hole is already there when you use Timken® seamless tubing. Often, you can go right into finish boring as your first production step. You save machining time. Screw machine analysis can be relaxed for other operations. You get added machine capacity without additional machines.

By using Timken seamless tubing in place of bar stock, you save steel, too. Scrap loss is cut. You get more parts per ton of steel. And to help you save even more steel, the Timken Company offers a tube engineering service which recommends the most economical

oil tube size for your job—guaranteed to clean up to your finished dimensions.

Timken seamless tubing gives you high control quality because the piercing process by which it is made is basically a forging operation. Result: a uniform grain grain flow for greater strength and a refined grain structure which brings out the best quality of the metal. And the Timken Company's rigid control keeps this quality uniform from tube to tube and from to best. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMKENCO".

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Telling the Market

Manufacturing Cost Control provides breakdown charts, cost control forms and performance curves for manufacturing firms, plus a five-step method of setting up cost-control system. Ask for Bulletin 117-48 from Howard F. Howard Co., 319 Fulton Building, Detroit 2, Mich.

Embedding of electrical components in kerosene-resin bonding resin which offers maximum adhesion, desirable strength, adhesion, low shrinkage and temperature stability is described in booklet available from Minnesota Mining & Mfg. Co., 960 Park Ave. S., St. Paul, Minn.

Applications of Du Pont nylon soldings are covered in a new series of booklets. Data is also given on molding and extrusion techniques. Write R. L. de Post de Nevers & Co., Willoughby 90, Del.

Plant layout is the third in a three-part set of administrative and operating courses. Included is an important new booklet for evaluating existing layouts. Earlier booklets cover "Material Handling and Industrial Maintenance," "Write Yourself Assistance, Inc.," 15017 Detroit Ave., Cleveland 7, Ohio.

Aircraft acoustical and thermal insulation are described in Applications to Aircraft, a booklet being distributed by Filingsis Corp., Toledo, Ohio.

Methods of optical gaging to cut in inspection and business costs are covered in 32-page booklet available from Industrial Optical Division, Eastman Kodak Co., 311 State St., Rochester 4, N. Y.

Aircraft plastic lubrication facilities and experience at Plastic Age Co. are described in brochure being distributed by the firm. Address: 495/557 Arroyo Ave., San Fernando, Calif.

The New Way to Solder explains resistor soldering and its uses in repair, detection and maintenance. Ask for Bulletin 315-D from Watcom Mfg. Co., Inc., 126 W. Gen. St., Joliet, Ill.

Custom molded nylon plastic parts, including tubes showing mechanical, thermal, electrical and other properties of this material, are described in Bulletin CDP-65 available from General Electric Co., General Division, Pittsfield, Mass.

Procedures Through Research is a special booklet which describes techniques used by Ramon Mfg. Co.'s Aircraft Division to describe the research, development and production facilities at

offer the industry, particularly firms in defense work. Write Ramon Mfg. Co., Aircraft Division, 11711 Woodlark Ave., Downey, Calif.

Hardness conversion tables for steel are on a wall-size collated card providing approximate relationship between Brinell, DPH (Vickers), Rockwell and Shore Scleroscope hardness values and corresponding tensile strengths of steel. Data comes from R.A.E. Institute, Write International Nickel Co., Inc., 47 Wall St., N. Y. 5, N. Y.

Carbide-tipped drills are Made and cutting feeds and application data are covered in 12 page manual being distributed by DeLano Saw & Tool Co., 1114 Kramer Rd., Columbus 3, Ohio.

Utility vice that eliminates a number of holding operations required in setting up work on drill presses, millers, grinders, shapers and other machinery is described in booklet available from Jones Engineering Co., Reading, Pa.

Hydraulic drill units are detailed and charts are given for optimum operation in catalog, from Delta Power Tool Division, Rockwell Mfg. Dept. DC-114, 400 Lexington Ave., Pittsburgh 3, Pa.

Light Ten tube in brass and fluor-type, and quick-change gear and tool change models are described in catalog available from South Bend Lathe Works 425 W. E. Madison St., South Bend 13, Ind.

Spaywelding equipment and techniques using Colsonoy hard facing alloys are described in brochure folder available from Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.

More than 1600 stock units and special assemblies, also electronic and electrical control systems, test apparatus, components, communication equipment line of Sylvania Co., are detailed in 32-page catalog being distributed by the firm. Address is 5701 Reading Rd., Cincinnati 13, Ohio.

New Addresses

George E. Hantz & Co., sales representing representatives for Adams-Rite Mfg. Co., Co-Operative Industries, Inc., and Electro-Synthetic & Mfg. Co., has moved its office to 1734 North Ellshade, Wichita 14, Kans.

Brown-Lite Corp., Beverly Hills, Calif., maker of special fittings, ball joints and stainless-steel bonding equipment, has opened a Southwest office at 6514 Col. Ave., Dallas, Tex.

SIMPLICITY in hydraulic pump design is important for these reasons:

The Pesco hydraulic pump is a gear design—the simplest of all hydraulic pumps. There are actually only three moving parts in the pump proper. Fewer moving parts mean—

- ... less chance of pump malfunction
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- ... less cost for overhaul
- ... less weight
- ... less noise

plus the EFFICIENCY of "Pressure Loading" which makes possible:

"Pressure Loading" is Pesco's exclusive development that automatically holds and clearance of gears to a thin film of oil, thereby maintaining the volumetric efficiency throughout the long service life of the pump.

- ... volumetric efficiencies up to 97% over a wide range of temperatures

plus STATISTICAL QUALITY CONTROL which assures:

- ... uniform high quality and performance of each pump
- ... a longer, trouble-free service life

Simplicity of design, efficiency of "Pressure Loading" and statistical quality control in all phases of manufacture, are three important reasons why Pesco pumps are standard equipment on military and commercial aircraft and on many automotive and industrial products. Write today regarding your hydraulic pump requirements.



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Gen. Putt Challenges Avionics Industry

- To management he looks for adequate production and research facilities; to engineers for improved quality.
- Security of U. S. and effectiveness of our military operations depends on satisfactory electronic devices.

By Philip Klass

Maj. Gen. Donald L. Putt says avionics and electronic equipment manufacturers to make the development of avionics and electronic equipment, and their use in military operations, wherever applicable, to improve reliability and to reduce size, weight, and cost.

"This is one of our challenges that Gen. Putt, vice commander of USAF's Air Research and Development Command, laid down to the management of the avionics and military electronics industries."

What the Military Executive-Speaking before the professional group on engineering management at the recent annual convention of the Institute of Radio Engineers in New York on the subject of "What The Military Services Expect From Engineering Management in the Electronics Industry," Gen. Putt also challenged the industry to:

- Establish permanent facilities devoted to solving military electronics problems.
- Be willing to undertake research and development programs without requiring assurance of a subsequent long-run production program.

To engineering management, Putt stressed these challenges:

- Improve equipment reliability.
- Broadenened simplicity.
- Design for easy maintenance.
- Develop new manufacturing techniques.
- Provide test equipment and handbooks on time.

"No Lack of Appreciation"—"There is no lack of appreciation . . . for the tremendous job you have already performed," Putt said, emphasizing that specific criticisms did not apply to all of the industry. Nor did he deny that the military services were sometimes unfairly responsible for their own problems.

Gen. Putt noted that the industry recognizes that "the success of our military operations is almost wholly dependent upon the availability . . . of systems of electronic devices." He cited three examples:

- B-55 bombers. The loss of 11 crew

members and the success of a B-55 last year depend upon the successful operation of 2,100 vacuum tubes and thousands of associated avionics components and parts. These devices perform a multitude of vital tasks from the moment of liftoff until the final landing. They provide engine stabilization, are used to navigate, to detect and shoot down enemy fighters, to aim and guide the bombs to its target, and to bring the plane in for a landing in any kind of weather.

• **Interception.** The interceptors of the next future will have automatic avionics systems which, like ones on the plane in a scheme. Ground order will automatically direct the plane to the vicinity of the target at which point the interceptor's own radar fire-control system will then take over to put it on a pursuit course.

When the target is within firing range, the missile component will automatically aim and fire the weapons and then maneuver the interceptor to avoid collision with the target. Avionic equipment will then automatically bring the interceptor to its base and bring it in for a landing. The pilot will have only to fly the final sections of the landing.

• **Challenge to Top Management.** To meet the military electronics needs of the future, ARDC's vice commander called for top management to build facilities devoted permanently to military electronics programs. He also called for "well laid plans for conversion of commercial capacity to dedicated work and when required." Putt noted that "today military requirements are completely fulfilled on this day of the atomic bomb, conventional weapons . . . (which) disappear in an instant."

"The reluctance of some segments of industry to undertake military research and development work without the assurance . . . of a long production run to follow immediately is causing grave concern among the military," according to Putt.

He called management to recognize that many research and development



About Gen. Putt

Maj. Gen. Donald L. Putt, vice commander of the Air Research and Development Command, received military service as a second lieutenant in September 1938. In October he was assigned to the 37th Pursuit Squadron at Selfridge Field. He attended a number of courses and studies technical schools receiving a Master of Science degree in aeronautical engineering from California Institute of Technology in 1950.

He was second assistant chief of staff for intelligence at ANAC headquarters, Wright Patterson Field in October 1941, and became deputy chief of the Engineering Division there in December. He was appointed director of research and development in the Office of the Deputy Chief of Staff for Missouri at Air Force City in September 1945, and remained in director when the division was transferred to the Office of the Deputy Chief of Staff for Development in January 1955.

He became assistant deputy chief of staff for development and later acting deputy chief, in 1952. In January 1952 he was awarded commandant general of the Wright Air Development Center of ARDC.

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programs go far beyond the present frontiers of technical knowledge. This means that some progress will not be made, unless "subsequent production" is possible.

- **Reliability Challenge.** Putt called for

mark greater equipment reliability, pushing out that failure in critical military equipment several years ago had it that time severely jeopardized one of the Air Force's most important operations. (That was probably a reference to the difficulties experienced when the new K-type radar bombing system was first introduced on the B-50.) Most of these failures were due to unreliable vacuum tubes, Putt said. He called for "higher quality components whatever the cost."

"Since we know that we can never achieve 100% reliability, we just need to make it sustainable," Putt said. Maintainability, he added, influences the cost of the overall military establishment, determining the quantities of material that have to be produced to sustain a given military force and cost.

• **Attention to Packaging.** Gen. Putt called on engineering management to give personal attention to the problem of improved equipment packaging to one cause of simplifying maintenance.

He urged the use of plug-in and/or three-way units over bakelite and wire unless otherwise possible to show whether the component is functioning properly. "A 'thousand' unit is a sub-assembly which normally is filled and sealed with a plastic mating fluid to prevent corrosion."

The speaker continued that engineering management must study the "complexity" of each equipment and component before deciding whether three-way component construction is feasible.

"This study must take into account the added problems of supply and warehousing and possible savings in man-power and overhead facilities. The study, Putt said, should include design areas with the military project engineers so that all factors may be considered."

Equipment must be designed to permit maintenance by personnel with a minimum of equipment and training, Putt said. He also urged that the equip-

ment be designed to require a minimum of maintenance in the forward areas so that the more complex work could be performed by experts in rear areas. Putt suggested that rear area maintenance could be performed by the equipment manufacturer.

• **Streamlined Simplicity.** ARDC's vice commander admitted that "the military have gone overboard at times in complicating military applications and at other times have been guilty of book-keeping."

But the military wants "the simplest equipment . . . that will insure our weapons' superiority . . ." Putt said. "Our problem is to determine what

point the . . . effectiveness of a weapon per unit cost (and complexity) begins to decrease."

Putt urged engineering management to point out to the military all unnecessary complexity and to expand more effort in simplifying complex equipment.

Productivity has not been an serious problem in the electronics industry in the aircraft and aircraft engine industry, Putt said, but he felt that sufficient had been done in the research and development of new manufacturing methods, techniques, processes and materials.

This was partly the fault of the sub-

NEWS
NOTES

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ters, the general accepted end used that
corrective steps were being taken to
improve the situation. The initial fix
was often the producibility in order to
ensure engagement on test and to hold
equipment costs to an acceptable mini-
mum.

► **Critical Problem—Putt** traced the
military's extreme difficulty in obtaining
test equipment, technical data, and
operating instructions on time and in
the quantities needed, a "most critical
problem." Conventional procedures and
procurement practices only led to frustration,
Putt said, "but we need the assistance
of industry to develop and supply the
operating information and test equip-
ment as required."

Digitizing from his prepared paper,
General Putt outlined an engineering
management to provide the military
with realistic schedules for research and
development and for production pro-
grams.

He pointed out that the delay of
a single piece of aviation equipment can
hold up an entire airplane produc-
tion program.

Following the formal presentation, a
question time was held. Gen.
Putt how a manufacturer could afford to
give advance schedules in proposals
and questions when faced with less
competitive competition. Putt admitted
that he had no solution to the problem
under all of industry submitted realistic
solutions.

► **Major Misunderstanding—**Recognizing
the considerable progress that he has
made in maintaining aviation equip-
ment, Putt called for more open partici-
pation in relating size and weight for the
supersonic aircraft and guided missiles
of the future.

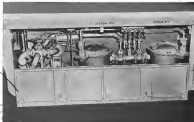
"The necessary hold transactions
prevent the achieving improvement be-
hind anything else appearing on the
development horizon," Putt pointed
out.

"Not only is there large profit in
achieving minimum size, weight, cost,
and power requirements, but likewise
great gains in reliability and ruggedness
of equipment appear possible." The
general said that "engineering man-
agement concentrate maximum efforts
wherever applicable to the further
development and achievement of transition
in present, development of diversity
and the application of innovations to
existing electronic equipment."

► **Fuel Challenge—**Gen. Putt called on
the industry to assure that the military
is provided with superior and reliable
electronic equipment, in proper quan-
tities at the proper time, compatible with
testing equipment, technical indexes
and operating instructions.

"We want your men of engineering
management to appreciate your respon-
sibility for the success of our military
equipment," Putt concluded.

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Avionics Companies Add More Space

Recent expansion in the avionics industry includes additions of more space by established manufacturers and acquisition of new facilities in the east and west.

• **Avionic Engineering & Maintenance Co.** of Oakland, Calif., has established an electronics division for assembly, development, and production of component parts for electronic and analog drives. Approximately 200,000 sq ft of the company's 621,000-sq-ft plant in Oakland is expected to be used for the new operation.

• **G. M. Glavin & Co.** has started construction on a new instrument assembly plant at 55 N. Vernon, Pasadena, Calif. Glavin builds precision instruments for aircraft and for guided missiles.

• **Palmer Electronics Corp.** has added 20,000 sq ft of working area in a new plant located at 2 Franklin Ave., Brookline, N. Y. Palmer manufactures electronic test equipment.

• **Avi-Meter Motors, Inc.** of New York has opened a manufacturing and repair service facility at 2733 Forest Ave., Los Angeles, to produce meters, fans, and blowers for West Coast aviation manufacturers.



ONE OF MANY. Plug-in test-point center is made up from all the other parts shown.

Plug-in Circuits For Easier Design

Equipment engineers can choose from a growing selection of packaged plug-in resistor sub-circuits, which can save much design time. Each single plug-in also contains a resistor, inductor and all associated resistors, capacitors, etc.

New lines of such units have been announced recently by two manufacturers. The units and their features:

- Twelve in basic types and 40 second-

ary versions are offered by Electronic Engineering Co. of Cambridge. The types include complex, 50/50s, multi-division, square-wave, pulse gate, repeat modulation, and "and" circuits, "or" circuits, and pulse amplifiers. Its literature is available from T. E. Condon, Flight Div. of the company, 150 S. Normandie St., Los Angeles 4, Calif.

• Working exclusively for 0.1-sec. pulses with a 2.5-sec. rise time, or 1.0-sec. pulses and 0.4-sec. rise time are available from the Electronics Div. of Avionic Machine & Foundry Co. AMF says that use of ferrite core in transformer permits high peak currents and allows faster pulse rise times. The company's offices in Boston, Mass.

Resonance Meter For Avionic Impedance

A new portable resonance meter suitable for measuring the impedance of aircraft antennas and feed lines has been announced by Geopon Electronics Mfg. Co.

The device, essentially a grid-dip meter, can measure impedances in the range of 50 to 100 ohms and reactances of 4:4 to 300 ohms. Plug-in attachments enable the device to generate passive carrier frequencies between 2.5 and 215 mc.-An RF probe

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1 Use the applicator to dip the 3M-900 sealant into the jar in a steady path.



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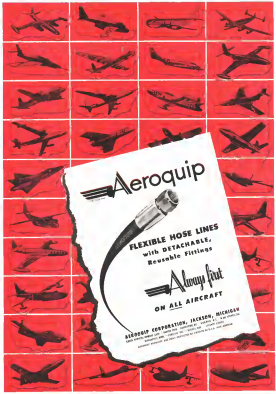


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Oregon Electronic Mfg. Co., 2332 East Riverside, Portland 15, Ore.

Lab Testing Gets New Equipment

Newly developed electronic instruments for laboratory testing or measurement include audio oscillator, work meters and phase meters. These units have been announced recently.

- ▶ **Audio oscillator.** Especially useful for checking FM/PM referencing subcarrier equipment, the Model TD 100 oscillator has 20 fixed center-frequencies between 600 and 7,800 cps, with other frequency ranges between 200 and 100,000 cps available on special order. Individual frequencies are selected by peak-to-peak and can be varied 10% with a calibrated potentiometer. Frequency accuracy is reported at $\pm 1\%$ and zero cross deviation at full output at less than 1%. Dept. AW, Teletronics Laboratory, Inc., 74 Kissel St., Westbury, N. Y.
- ▶ **Electronic wattmeter.** Model 110 can measure power of 0.5 to 300 watts, or up to 9,000 watts with auxiliary shunts, at frequencies of 10 to 3,000 cps. Accuracy is 2% at full scale and repeat me-

asures is 99,000 ohms to the potential circuit. \$5 to the nearest dollar, according to the manufacturer, Radio Electronics, 1866 Cottage Ave., Cleveland 15, Ohio.

▶ **Phase meter.** Model 404A provides direct indication of phase angle between two a.c. voltages of either symmetrical or unsymmetrical wave form at frequencies of 60 Hz up to 100 kc, or down to zero cps, with an external meter. Input voltage range is 0.5 to 100 and accuracy is $\pm 1\%$ to 10 kc, increasing to 9% at 100 kc, with external indication, according to manufacturer, Advance Electronic Co., P.O. Box 394, Passaic, N. J.

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- ▶ **Northwest Telen Colfax IFS.** Northwest Airlines has installed a Colfax Radio integrated flight system (IFS) directly on a Boeing 707 airplane. In evaluation, modification includes newly developed front-to-back course indicator.
- ▶ **New Fire-Extinguishing Technique.** General Electric has developed a new heat-treated plastic which offers increased protection against fire due to dust currents in avionics equipment. Designated GE 1154, Treshite, the new material is

self-extinguishing in one minute or less, GE says. New materials reportedly have low moisture absorption and excellent electrical properties. It is available from GE's Chemical Dept. in thicknesses of 0.015 to 0.25 in.

▶ **ECA to Try Wilson CAT.** TransCanada Air Lines is planning to install one of the recently announced Wilson Electric computing automatic track-aid (CAT) on a DC-3 for evaluation. The Wilson CAT, a simplified flight director for ILS approaches, is now in operation on many Eastern Air Lines transports (Aviation Week Apr. 10, p. 55).

▶ **Study Polar Communications Risk.** The University of Alaska is piloting data and studying the communication blockouts frequently encountered in the polar region in the hope of being able to predict their occurrence, according to Col. Brent Ribben, command pilot.

▶ **Beckley to Distribute Digiflex.** Berkeley Scientific Division of Radcom International Co., Redwood, Calif., has been named distributor for "digiflex" manufactured by Coleman Engineering Co. of Los Angeles. Digiflex are used to convert computer or analog circuit voltages from analog into digital form.

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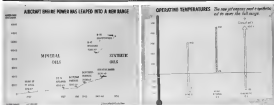
STRUCTURAL HONEYCOMB in ALUMINUM GLASS FIBRIC - STAINLESS STEEL - COTTON FABRIC



North American Aviation Company's F-86D fighter jet uses Hexcel's aluminum honeycomb for radar-transparent cuttings of the skin 1/4" thick.

Photograph courtesy of North American Aviation Company

EQUIPMENT



New Oil Will Take Hotter Jets Higher

Esso's synthetic resists altitudes and temperatures that make conventional mineral lubricants wilt.

By George I. Chivileva

A new synthetic jet engine lubricant, possessing a combination of properties not to be ascribed to a single mineral oil, was recently taken from under secrecy wraps (Aerospace Week, Apr. 13, p. 7).

Standard Oil's Esso Aviation Turbo Oil 51 has a temperature range wider than any single petroleum lubricant.

It can be flown to much higher altitudes before losing its high temperature, yet it remains fluid at Arctic temperatures.

Its lubricating capacity is four times that of light mineral oil.

The new oil resists accelerated decomposition and formation of carbonaceous deposits better than mineral oils. This is particularly important because of considerable heat soak-back, as jet engines after shut-down. Although operating at temperatures seldom exceed 415°, soak-back temperatures may climb to 571°F. Coke deposits can plug oil passages and liners, causing an accident.

First to be approved—EATO 15 is the first and (until now) the only synthetic lubricant to be approved under U. S. Military Specification MIL-L-1508 for synthetic jet engine lubricants, according to Standard Oil officials. They add that it is the only one now recommended by Wright Amendment's 301 Specifier for the complete range of power settings. The new lubricant comes from the Standard Oil Development Co., central research

and engineering affiliate of Standard Oil (N. J.).

A jet engine, Esso Aviation Turbo Oil 51, was developed in parallel in England by the Esso Development Co. Ltd. This oil has given satisfactory performance in all British turbojet and turbo-prop engines, say Standard spokesmen. Moreover, they state that the latest work of Rolls-Royce, Pratt and Whitney, Siddeley-Deputon and other turbojet engines cannot be operated under design conditions on any other lubricant.

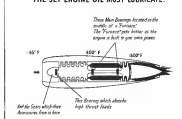
Unavoidable quantities of the com-

ponents used in the formulation of EATO 51 are being reported for use in U. S. Esso developments, the British firm states.

But Though Tuzen—A recent demonstration of EATO 15 showed these qualities:

- **Hotter and higher.** Heated to 450°F, temperature to be expected at a jet engine's main bearings near the turbine, the new oil resisted altitudes of 50,000 ft. before giving any signs of boiling. The best light mineral oil began to boil at 40,000 ft., and bubbled furiously at 50,000 ft. Under actual flight conditions, boiling means excessive oil consumption and inadequate lubrication.
- **Cooler and thicker.** Engine oil is

THE JET ENGINE OIL MUST LUBRICATE:



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L'O-F Super Fine Fiber Glass blankets provide excellent sound and thermal insulation for your aircraft.

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Performance of Lubricants in Advanced Design Turbojet Engines*

Lubricant	Mineral Oil		Ester-Type Synthetic Oil		
	Shell 100	A	B	C	D
Viscosity at 100° F.	7.5	7.5	5.5	5.5	5.5
Time of heating lubrication	Time required to heat	Excellent	Good	Excellent	Excellent
Oil consumption	High to moderate	Low	Low	Low	Low
Deposit and corrosion	High to heavy deposits, some corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion
Low temperature pourability (min.)	-10 to -50°	-50°	-40 to -100°	-40 to -100°	-40 to -100°

*AECHEC Performance of Turbo Engine Synthetic Oils by Executive, Science, Sales and Production of Shell Ltd. Research Station.

Performance of Lubricants in Advanced Design Turboprop Engines*

Lubricant	Mineral Oil		Ester-Type Synthetic Oil	
	Shell 100	SAE 100 Grade M Min. O.S.	A	B
Viscosity at 100° F.	7.5	7.5	5.5	5.5
Time of heating lubrication	Good	Good	Good	Time required to compare
Oil consumption	Low	Low	Low	Low
Deposit and corrosion	High to heavy deposits, some corrosion	Heavy deposits, some corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion
Low temperature pourability (min.)	-10	-50	-40	-40

*AECHEC Performance of Turbo Engine Synthetic Oils by Executive, Science, Sales and Production of Shell Ltd. Research Station.

Properties of Aircraft Engine Oils*

Property	Synthetic Oil			Mineral Oil	
	A	B	C	SAE Jet Engine Oil	Typical Turbo Engine Oil
Viscosity at 100° F.	7.5	5.5	5.5	5.5	5.5
Time and heat of 100 to 1,000° F.	100	100	100	400	400
Flash point, °F.	400	400	400	350	350
Stability against loss of 400° F. of 1000 hrs.	3	3	3	100	100
Oiliness retention ability at 300° F.	Stable, no particles	Stable, no particles	Stable, no particles	Variable, increases	Variable, increases
Temperature range for 1000 to 1000° F. at 100° F.	-20 to -40	-20 to -70	-20 to -70	-40 to -70	-10 to 100

*AECHEC Performance of Turbo Engine Synthetic Oils by Executive, Science, Sales and Production of Shell Ltd. Research Station.

accepted to be fluid enough at -50°F. to be pumped up by pumps and forced through lubrication passages in the engine the instant the propellant is started, for immediate protection of all

bearings. Standard steel balls and a steel ball refrigerated to that temperature and an electrolytic stress tester for metal test. Heavy metal oil was completely

solidified at -65°F. Light mineral oil and EATO 15 were still fluid. When the stress, which rotated at 900 rpm under no load, was increased in the light mineral oil, it slowed down to approximately 150 rpm. But when the stress was switched to the synthetic oil, it was restored only to 200 rpm, showing that the synthetic lubricant was more fluid than light mineral oil at the low temperature.

• Stronger and tougher. Load-carrying characteristics as lubricity (the ability to maintain a film of lubricant between two pieces of metal under pressure) of EATO 15 and light mineral oil was compared on an Alston lubrication tester. Weights were added to one of the bars at a rate of one every ten seconds. When getting that shaft was lubricated with light mineral oil, the addition of the third weight created enough friction to break the shaft. With synthetic lubricant, seven weights were added before the shaft broke, indicating that the new oil could carry a considerably larger load than the light mineral oil.

• Viscosity—This is how the synthetic lubricant stands up against conventional mineral aviation oil of 100 seconds viscosity at 100° F.

• EATO 15 has a viscosity of 15 centistokes.

• EATO 35 (the British formulation) has a viscosity of 35 centistokes.

• Conventional mineral oil has a viscosity of 100 centistokes. Although the synthetic lubricants are light enough to ensure fluid at low temperatures that completely control 100-second mineral oil, their viscosity exceeds that of mineral oil at high operating speeds and temperatures.

Importance of good lubricity is pointed up by the fact that jet engine accessory power takeoffs may develop some 150 hp. Oil even grants importance to the need for adequate sizing of the propeller driven an engine which transmit several thousand horsepower.

By incorporating synthetic lubrication, synthetic oil can have considerably better high-temperature oxidation-corrosion stability than jet engine mineral oil. Laboratory tests at 1475° F. have shown that synthetic oils are stable, non-corrosive, and 1000 jet engine oil and 1100 piston engine oil are unstable, corrosive.

• Problem of Seal—One present drawback of synthetic oil lubricants is their effect on sealing rings. Synthetic rubber seals used with conventional mineral engine oil deteriorate badly when used with synthetic oils, especially at high temperatures.

New seals, capable of being used with the synthetic oils are being developed.

• Full Pima Eaton-Standard Oil co.



Northrop's Prime Equation

Northrop Aircraft production specifications include and install: two-wing, cast wing nacelles. The "hot-shed" assembly technique, fibrous-reinforced, precision installation of equipment in Scorpion F-49 interceptors now in production.

Equations are used to solve problems. At Northrop Aircraft, the prime equation combines teams of administrators, outstanding scientists, and production specialists with modern industrial and research facilities. The combination efficiently designs imagination and knowledge into actual material of advanced design and irreplaceable value.



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From top left to the clock position: test with X-ray knowledge; and the revolution may revolutionize aviation.

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Aircraft engineers and designers are seeking a similar goal. Unitedly, they agree: We must eliminate the chances of a failure. In this quest to prevent the chance of failure in systems, Meletron has perfected pressure actuated switches for every requirement. With these reliable instruments, we are eliminating chances of failure.

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E. J. & BROTHERS, 2020 First Street, Newark, N. J. 07102
W. H. WATSON, 10010 BOWLING GREEN, LOS ANGELES 44, CALIF.
AFL, 302 1st St., Northwest, Washington, D. C.

claim say that their new lubricant is really synthetic. It is synthesized from "cleared kerosene blocks"—even in this case.

The starting materials for producing kerosene can be obtained from petroleum, although the present product is not yet derived entirely from petroleum. Standard Oil says: The company hopes eventually to produce the kerosene entirely from petroleum. This will allow Standard Oil to increase production and decrease price of the product.

Current cost is considerably above general oil—possibly in the \$9-110 a gal. range. Although costs will drop with increased production, even today's high price may prove not too objectionable because of the very low oil content of a jet engine—about a quart an hour, according to Standard Oil spokesman.

The oil is being produced by several Standard Oil plants and cannot supply regular demand, company authorities say.

Manufacturers' Tests—Much work is still to be done in testing the new synthetic lubricant now done by jet engine manufacturers. The oil has operated in engines on the ground and in flight for more than 10,000 test hours. In the air, this would be equal to more than 6 million engine miles of flying.

Standard Oil Development Co. has been working on the synthetic oil since 1947. It first became commercially available in 1951, and is being used in such jet engines as the P77, J57 and T40 turbojet powerplants.

At the 1952 SBAC display in England, these aircraft engines were exhibited with KATO 15, Rolls Royce Avon in the Elvraut Hawk, de Havilland 134, Vickers Valiant, Supermarine Swift and English Electric Canberra (with afterburner), Avrocar, Siddeley Sycamore in the Canberra Jet and English Electric Canberra.

Standard Oil's engineers believe that this synthetic oil marks the beginning of a whole new concept in lubricant production and performance. As jet engines get bigger and hotter—and they are bound to—ever higher quality lubricants will be required.

"Much attention is to be placed in this field," Standard Oil adds, "and one thing is certain—the jet engine lubricants of the future will also be synthetic."

Slip-Tube Joint Uses No Fitting

The possibility of joining aircraft tubing without the use of special fittings is being explored by Vickers, Inc.

In informal tests, Vickers has been

bolting the ends of two pieces of tubing and covering the joint with a sleeve of tubing whose inner diameter equals the outer diameter of the pieces being joined. Stainless steel sleeves are currently used to place aluminum sleeves are attached with a heat-cured adhesive. Vickers points out that elimination of fitting makes the joints extremely strong, and because no fitting is required, both weight and space are saved.

Cycling tests of the slip-joint assemblies at Vickers' Detroit lab have shown these results thus far:

- 2,000-1,000-psi. test sig.
- Stenders used past 100, 91 million cycles without failure. Joint finally blew at 14,000 psi pressure.
- Aluminum joint ran gone through 1,250,000 cycles without failure.
- 65,000-psi. test sig.
- Stender steel joint has been through 201,000 cycles without failure.
- Aluminum joint ran gone 114,000 cycles without failure.

The standard tubing used by Vickers comes from Superior Tube Co., Norristown, Pa. aluminum tubing comes from Alcoa's tubing company of America, Pittsburgh, Pa.



Ni-Ca Cells Hit at One Cause of Crashes

The military's interest in long-life nickel-cadmium storage batteries stems as much from the loss of three C-119s as from the loss of three C-119s. The latter was a result of lead-acid battery trouble, Marine Col. E. C. Hart, director of Bell's electronic division, has told Aviation Week.

The Pacific warbirds followed this sequence: voltage regulator malfunctions caused batteries to overcharge; electrolytic boiled off; battery plates buckled and contacted each other; circuit short that caused eventual complete failure of aircraft electrical system and the planes crashed.

This will be applicable with the



SPRAY GUNS for every purpose and material

Today, thanks to recent developments in spray gun and material handling pumps you can use spray guns for just about every job.

For example, the Binks line—in addition to guns for normal applications of high-quality aircraft finishes—includes equipment for automatic painting of wheels, under shades for speed plugs, replacement parts, etc.—and for spraying heavy materials like dope, cellulose and insulation.

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Combustion section life increased over ten-fold



The combustion section of jet engines was given an unprecedented lease on service life with the introduction of the "step wall" liner. The unique design of this combustion chamber liner has proved itself beyond question in the unexcelled combat record of the Westinghouse J34 engine. By eliminating severe hot spots and their heavy oxide damage, the liner answered one of the most critical of all service-life problems.

The actual design features of the "step wall" liner, a Westinghouse patent, stand out at a glance. In place of the usual cylindrical sheet metal construction, telescopic circular sections have been fitted together. This gives the liner a stepped contour, instead of a flat surface, allowing a continuous blanket of relatively cool air to pass over its surface. The result: protection from the ravages of temperatures over 3000°F.

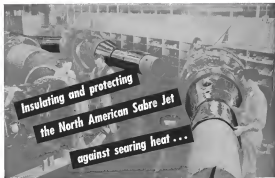
While the J34 was setting its unexcelled combat records at Korea, Westinghouse engineers were designing another new jet engine, using the "step wall" liner—the J40. Already severe altitude and wind-tunnel tests have been made. Again new records have been set . . . over 700 hours without a major component change. And again Westinghouse engineers have new designs on their drawing boards . . . new plans to keep advancing the jet engineering of today, with an eye to faster, more economical air transportation tomorrow. Westinghouse Electric Corporation, P. O. Box 288, Pittsburgh 30, Pennsylvania. 19611



"Step Wall" Liner—Full view of combustion chamber liner shows stepped contour design on both inside and outside surfaces.

YOU CAN BE SURE...IF IT'S
Westinghouse





... with Johns-Manville THERMOFLEX BLANKETS

TIME PRODUCTION LINE SCENE in the North American Aviation plant at Los Angeles shows Thermoflex® Insulation Blankets being applied to tail pipes of North American Sabre Jets on order for the United States Air Force.

New standard protection for many Air Force and Navy jet aircraft. Also flexible blankets insulate and protect the engine against scorching heat generated by jet power.

Thermoflex Blankets are custom-fabricated with highly stable Thermax® RT Fib. Developed by Johns-Manville Research and Insulation Engineers, this patented refractory fiber felt is sealed between sheets of corrosion-resistant metal foil. In manufacturing Thermoflex Blankets to specification, careful attention is given to the economy of design for engine supports, actuator mountings, hot lines, thermocouple leads



Each North American Sabre Jet, covered with the General Electric J47 turbojet engine, has blankets through the tail of double wall turbine exhaust.

and other controls. The precision-finished grooving and edges of the blanket... the close fit at corners... automatic maximum insulation value for the entire application. Furthermore, edges at corners are suitably sealed to prevent fuel penetration into the insulation.

In addition to insulating tail pipes, engine cones, turbine casings and turbochargers... Thermoflex Blankets in special preformed shapes are used to insulate, protect, and safeguard fluid storage tanks, air conditioning systems, divisional ducting, ducts and many other assemblies in all types of vessels.

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Circle 10 on Reader Service

PRODUCTS for the AVIATION INDUSTRY



Johns-Manville

nickel-cadmium batteries, because they are normally sealed as standard aircraft cases, Red says. The battery does not generate gas (sealed type produces hydrogen) and since the most a sealed, there is no need to check fluid level to watch about rupture of electrolyte during rough flight. The electrolyte in the Ni-Cd batteries is a non-corrosive alkaline fluid, whereas lead acid type used earlier acid.

Navy's order of 2,000 of the new batteries from the French firm, Societe Accumulateurs D'air et de Yverdon (Aviation Week Mar 16, p 10) follows a test of 21 production units delivered about six months ago. An earlier lot of 10 developmental batteries was delivered for analysis 15 months ago.

Initial cost will be \$300 a battery, but it is expected that as later orders the cost will be halved as tooling costs are absorbed.

For the present, Ni-Cd batteries will be made in the same dimensions as the old style units, so they can fit in present battery boxes. But it is believed that the same capacity can be obtained from smaller, lighter units in the future. The life of the nickel-cadmium type may equal that of the nickel they go in, Red says, although this type does not equal the capacity of the new type batteries is 90% greater than that of lead-acid batteries.

First official U. S. contact with the nickel-cadmium battery was during World War II, when it was encountered in the German Focke Wulf 190. Efforts of the Navy and Signal Corps to copy it cost more than one-half million dollars, but the project failed to follow.

The French firm, SAFT, probably has two-thirds of the world's know-how on nickel-cadmium. During the war, the leading units were being produced by SAFT, by a German plant in Hanover, and by the Juergen Co in Sweden, which still produces them for the Swedish Air Force. SAFT bought the German plant after the war and moved it east of its engineers to France.

SAFT is now producing Ni-Cd batteries in its plants at Roubaixville and Bordeaux.

High-Temp Anti-Icing Hose

A new high temperature anti-icing hose for jet engines is being produced by Aerospace Corp. The hose consists of an inner layer up to 45F to do its anti-ice job. It is made of a silicon, rubber like material, the monosiloxane resin.

Here it is equipped with the Aero Corp's recently developed Little Gas, and being to give improved sealing of fitting to hose.



Aero Commander

equipped with

KLIXON BREAKERS

for reliable Circuit Protection

The two-engine "Aero Commander," manufactured by Aero Design & Engineering Co., Oklahoma City, is a deluxe executive light-weight transport that is setting new performance standards. Among the many design features are high wing design, low-level cruise and unobstructed seating.

To prevent electrical circuit troubles, Aero Engineers specify and use Klixon switch type Circuit Breakers on every circuit requiring protection. They have found that these switch type circuit breakers save space, simplify pilot procedure on electrical circuit system operation and produce a system of extreme flexibility.

Lightweight, small and compact, Klixon Aircraft Breakers operate surely regardless of altitude, vibration, shock or motion... tripping out the circuit when internal troubles jeopardize the electrical system. Yet, harmless momentary transient shorts do not cause nuisance trips-out.

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Division of Westinghouse Electric Corporation
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NEW AVIATION PRODUCTS



Ultrasonic Cleaner Shakes Off Dirt

Intricately shaped parts can be cleaned faster and easier with an improved ultrasonic degreaser developed by DeSoto Corp. The new sound is said to have greater flexibility than previous methods of this type.

Foreign matter that is difficult to remove by ordinary methods usually collects off jet engine blades and other parts goes this treatment. In the case of jet blades, new metal parts used to detect fires is removed practically instantaneously.

Key to the improved performance of DeSoto's Soundless process is a new man-made ceramic transducer element. The ceramic element can be mounted in areas and it arranged to demand low maintenance effort. They and the objects to be cleaned are mounted in a solvent such as trichloroethylene.

Ultrasonic cleaners have depended on the push on quartz transducers, but these have their sound waves at a single point, limiting their effectiveness. The new ceramic transducers send out 430-830-cps waves along their complete length. At present, this is six inches. The process operates at 40 volts.

Instead of frequent cleaning, large batches now can be put in the ultrasonic and cleaned continuously, the company says.

First unit employing the Soundless process has been purchased by Reming-ton Rand, Inc. This machine is the largest ultrasonic degreaser ever built. DeSoto says.



HIGH-FREQUENCY SOUND waves in pulse wave mode pulse jet jet engine turbine.

Soundless facilities can be added to regular degreasers to provide an additional cycle for "maximum refinement in cleaning parts."

DeSoto Corp., Detroit 12, Mich.

Nickel Sheet Lets Air Through, Bars Water

A porous nickel sheet for housing aircraft servomotors and sensing gas presents customer of moisture but permits rapid equalization of air pressure to other matters altitude change, says its maker, Moss Metallic Corp.

The sheet is aluminum-treated by va-

por repellency and will not pass water if the differential is less than 3 psi. However, it passes air freely, according to the firm. The moisture and is said to be sufficient to protect servomotors from rain or accidental moisture in water.

The material can be exposed on outer surfaces of aircraft trailing of titanium spools with only occasional reworking required against water moisture. Under less stringent conditions, the coating is permanent, the company says.

Moss Metallic Corp., 53 Beech St., Glassboro, N. J.

New Copper Alloy

Development of a copper base alloy, intended for limited replacement of some beryllium-copper alloys and having possible use in aircraft instruments, was awarded at the Western Metal Cntr. group held recently in Los Angeles.

Research and development of the product was carried out by Battelle Memorial Institute in behalf of International Business Machines Corp. The alloy is considered "a new alloy for electrical contact springs," among other uses. It contains about 10% nickel, 1.5% silicon and 4% aluminum.

One of the new alloy will be substantially less than that for copper-beryllium alloys, currently selling at \$71.50 per pound. Beryllium permits supply of the latter is critical because of possible large-scale use of beryllium in the atomic energy program.

Properties listed for the new alloy include good electrical conductivity, corrosion resistance and springiness. The alloy is hard and strong, yet soft enough for forming before finishing.

Battelle Memorial Institute, 505 King Ave., Columbus 12, Ohio.

Simulates Desert

A new need and dust cycling machine for accurate testing of military components under desert conditions is being produced in several units.

The tester is designed to permit precise control of environmental conditions and climatic constant normal capabilities. It also is said to require less floor space than previous types. It was built specifically to meet requirements of MIL-R-5172A and MIL-R-5172A.

The unit is said to embody "novel" new concepts of streamlined airflow which reduce power needed to move air. Automatic controls enable it to simulate desired conditions for long runs. Humidity adjustment also is provided for pre-conditioning the required dust. Unit is furnished complete with dust supply and necessary accessories.

Aerovics Research Corp., Bristol, Conn.

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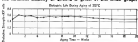


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Many of the men able designers, like those Westinghouse men who made automatic cooking a practical reality, save time and money by trying Silastic first when they need rubbery properties at temperatures far above or below the limits of any ordinary rubber. And exceptional stability at both high and low temperatures is combined in Silastic with excellent resistance to outdoor weathering and good tensile strength in a variety of hot oils and chemicals. Further proof of the inherent stability of Silastic is given in the graph below.



Dielectric Strength (KV per mil) vs. Aging Time - Hours

showing the effect of aging at 273°C (521°F) on the dielectric strength of Silastic.

Dielectric strength measured with 1/4 inch electrodes in air on two layers of Silastic E Tape, for example, average 0.43 KV per mil. After 20 weeks of continuous aging at 273°C with both surfaces exposed in an air circulating oven, dielectric strength gradually increased from a high of 0.401 to 0.433 KV per mil.

That's the kind of performance that makes Silastic the Dow Corning silicone rubber, unique among all rubbery materials. When you need rubbery properties at temperatures above 150°F or below -40°F, or excellent dielectric properties in a resistant and flexible material subject to the extremes.

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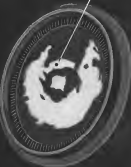
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Like a powerful telescope, this advanced radar equipment enables the pilot to study obstacles "long-range" in a choice of five different ranges between 3 and 200 miles. Here is a complete background study that will notify before obstacles can be seen directly. It can locate ground-level and other cloud elevations—tells the pilot to



avoidance is safe means. If one may identify, otherwise, the pilot the actual characteristics of the ground

is being seen. It can help the pilot know his place on the desired flight path. It can even be used in a visual check against the landing and approach instruments in the plane.

The new Radar Radar, made by RCA for the Navy Bureau of Aeronautics, is another technical achievement worked out in close cooperation with the military to learn it is necessary in situations, then the RCA engineers and field technicians in your branch of service.



RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.



Avionics Test Leads

Av-O Traces is marketing a test lead kit complete with a variety of snap-on accessories for universal testing of avionics equipment.

The kit permits simple interconnection between electrical components and includes both proper and probe-type leads. These may be fitted with probes, clips or other contacts, permitting connection with pen probes, banana jacks, terminal pins and other hardware.

An exclusive feature of the kit is a polyethylene plastic probe which can accommodate aviation components in its hollow center. Alligator clips supplied are fitted with vinyl plastic sleeves. The set is designed to meet average laboratory needs.

Av-O Traces, Box 31, Lancaster, Calif.



New Cold Chamber

All-weather test chamber that can drop the temperature to -310° and cure components through a wide range of altitude and humidity conditions are heavy custom built by Coastal Industrial Centers.

The equipment shown here is installed at Navy's Aircraft Instrument Laboratory in Philadelphia. Refrigerant compressor for the stainless steel chamber are the sealed type, arranged in a new cascade system made to improve performance and flexibility. Test cycle

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tools are needed more quickly. Requests for the color are Form 13 and 22. Temperature can be set at any point from -150 to 200°F. Heat is supplied by stainless steel sheathed strip heaters.

Altho conditions are provided in a chamber within the main chamber, which in effect insulates it from any outside ambient changes. Capacity of the main chamber is for dry air at 2 cu. ft., but can range up to 30 cu. ft. The refrigeration system is housed in the air-cooled compressor cooling coils, heaters, fan and suction pump are located immediately below the test chamber, accessible through a hinged access door.

Crossed Industrial Cooler, 22 W Fourth St., Heliand, Mich.

Lab Measuring Units

A line of measuring instruments for ground and light measurements has been announced by Scientific Reference.

It includes inductive and floating strain wire type transducers, linear accelerometers, angular accelerometers, pressure and differential pressure transducers and strain gages.

Among advantages cited by the company for the instruments:

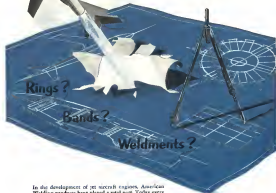
- Immediate response in only about tenths of a second
- Complete insulations can be measured with no response to centrifugal and vibrational forces.

• Response superior introduced by components of explicit motion are eliminated.

• Inductive-type instrument gives most accurate readings and meets certain requirements not possible with strain wire type instruments.

The instruments generally have an accuracy of 1% of scale or better and operate through temperatures from -65 to 200°F. Resolution is 0.05% of full scale or better. Ranges are 25G to 1000G for linear accelerometers, 0.1 rad/sec² to 3000 rad/sec² for angular accelerometers; 0 to 250 in 1540 and 0 to 5 psi and up to 100 psi pressure and differential pressure transducers; and 0.01 to 10 in. Hg vacuum gauges. Scientific Reference, 212 N. La Brea Ave., Hollywood 38, Calif.

Would a Welded Component solve your design problem?



In the development of jet aircraft engines, American Welding products have played a vital part. Today every major U. S. jet engine manufacturer is a user of American Welding rings, bands, or components.

We do not know what you, guided engineer or machinist you are working on, but we feel sure that our 34 years of welding experience can be helpful in giving your design "of the blueprint — into the blue".

In addition, we can provide designing, engineering, metallurgical and machining facilities. If your requirements involve either fusion or resistance welding of ferrous or non-ferrous metals, we will be glad to have our Product Development Department look into your problem.



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SQUEEZE

The 15,000-Ton

Alcoa's new 15,000-ton forging press recently went into operation at the Cleveland Forge Shop. An important addition to the country's largest aluminum forging facilities, this new press will form larger and more intricate structural shapes. It is the first step in Alcoa's "big press" program to give better service to America's aircraft industry.

Aircraft and Parts Manufacturers—

should have Alcoa's "How to Do It" books and steel guides in stock for their shops. Ask for one of the following books: *Forging Alcoa Aluminum*, *Designing for Alcoa Die Castings*, *Designing for Alcoa Forgings*, *Alcoa Aluminum and Its Alloys*. *Special Files* are available in most fabrication processes.

ALUMINUM CORPORATION OF AMERICA
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ALSO ON THE MARKET

French milling machines built to American specifications are available in three models, including combination vertical and horizontal type. Rigidly constructed for heavy duty service, they are equipped with automatic cycle control and powered by 25-hp motor—Mancy Machinery Co., Inc., 403 Broadway St., New York 13.

Improved vitrified bond for grinding wheels for precision work is said to be available which to do more pieces per dressing and to cut cooler, true and faster, leaving no jagged edges, and cover a wider range of jobs—Norton Co., Worcester 6, Mass.

Template making is streamlined with adjustable profile template which can be made to fit almost any profile to close tolerances, one term of lead formation, each only \$97 stock—Toolcraft Mfg. Co., 6679 S. Duane Ave., Chicago 37, Ill.

Stud threading and setting is done faster and with less damage to stud bolts with new Kerline Stud Puller. Check tool adaptable to die, punch, lathes, portable machining machines and similar equipment does not score or cut, jams and virtually eliminates breakage, according to distributor—Laver, Inc., 770 S. Second St., Salt Lake City, Utah.

Two multiple tap modes increase speed and accuracy in all directions on parts in both cut, shagging damage, when frequency as well as accuracy is desired, tap moves forward with each stroke—Impact-O-Gaply Corp., 1050 Rockliff Ave., Cleveland 15, Ohio.

Major air cylinders with universal piston stroke can be used for cycling and reaction of work and cleaning parts in wash up and fixtures. They deliver 75-lb thrust when hooked to 90-psi source line—Air-Mite Co., 4117 W. Carroll St., Chicago, Ill.

Spay White cleaner has been developed as a faster, safer means of removing grease, wax, paint, dirt, carbon and other foreign matter from virtually any type surface without danger to personnel or damage to product—Kohn Products, Inc., 1218 N. Main St., Los Angeles 13, Calif.

Air gage (No. O-Kinet) Model G Case version) with recently developed amplifying unit permits 10,000 to 1 scale location and has improved indicator—Parr & Whitson, Div. of Niles-Bentzen Prod. Co., Waco, Hartford 8, Conn.

triple threat

Changing temperatures, vibrations, and accelerations affect the operation of all instruments. In spite of these variables, our products provide the right answers because they are properly designed.

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You want and must have completely reliable temperature control amplifiers—amplifiers designed and constructed to meet specific built-in requirements of your turboprop engine, such as:

- Efficient operation in ambient temperatures from minus 50°F to plus 200°F
- Vibration resistance covering a range from 2 to 250 cycles per second.
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- Control-of-gravity shock, according to permit installation right on the turboprop engine.

Moreover, Maxwell & Moore turboprop engine temperature control amplifiers adjust all four requirements. They incorporate a highly successful design principle thoroughly proved during years of concentrated research, development and tests developed exclusively to automate control systems for jet airplanes.

We believe our ability to apply our unique design technique to specific and unusual turboprop engine temperature control problems can be of real value to you. Our engineering counsel and extensive manufacturing and test facilities are at your service. We welcome your inquiry.



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AIR TRANSPORT

Fares Hearings Up to New CAB Member

- Denny has decisive vote on motion to dismiss.
- The outlook: a toned-down earnings "survey."

By Lee Moore

Outlook last week was that Civil Aeronautics Board would go ahead with its investigation of domestic airline fares and earnings.

The Board was split five-to-two on an earlier petition to dismiss the case until the new fifth member, Harmer Denny, prepared a compromise decision in favor of proceeding with a toned-down version of the investigation. He wants it to be one of a survey that the previously scheduled battle raged between the airlines and the CAB rate-making staff.

The case at issue is the General Fare Investigation. Faral hearings tentatively are slated to start next week. All the trunklines recently petitioned for dismissal of the case, immediately after taking office. Denny now expects to cast the deciding vote as the battle heats were down up as follows:

- Oswald Brown and Chan Gurney, backed by all the trunklines, opposed continuance of the investigation.
- Joseph Abess and Josh Lee, backed by the entire rate-making staff, wanted to continue it.
- New member Denny indicated he would back the far less voting for an investigation. He did so was surprised that the Board never had announced the overall vote setup. But he was also surprised that it was scheduled to take the form of an "open-ended" leading to a definite Board decision—fare or down or continue the case. Denny said he wants the investigation to be kept open-ended.

Charles Ryan and the other members made last week were being holding a compromise version of the case, more on the order of a far-fading investigation and not necessarily requiring an immediate Board conclusion.

The domestic airlines which have recently petitioned CAB to dismiss the investigation, already started the public discussion a year ago. This had stirred much public interest but now they first had Board investigation of this creature may lead to better fare.

• The Board—Main axis of the investi-

Domestic Trunkline Earnings Ratios

(Excludes trunkline with foreign airfares ratios)

	Net income as investment*		Operating profit margin**	
	1952	1951	1952	1951
American (1)	15	14	14	28
Eastern (2)	12	15	13	21
United (3)	12	15	16	21
Continental (4)	12	15	16	21
Delta (5)	29	21	14	28
National (6)	28	28	17	28
Western (7)	43	21	16	25
Compucon (8)	38	15	9	—
Norfolk (9)	—	(1-7)	—	—
Average***	19.0	18.0	18.0	24.0
Weighted Average***	19.0	16.0	13	27

* Production net return after taxes on net operating profit on operations before non-operating income and expense and before income taxes.
 ** Operating profit margin for the line.
 *** Average is mean of individual airline ratios, divided by number of lines. This figure is related to the CAB rate-making staff.
 (1) Flight earnings of all trunkline air carriers in the city-state system and net profit divided by their total net assets. (2) Profit margin, in the city-state system, equal to (1) income divided by their total assets. American Airlines and United completely exclude line data system.
 (3) Book and operating of international routes considered as a bonus.

Source: From 41 reports of income to CAB, rates compiled by American News and CAB Rate Division.

gation are to find out how high fares would be set to build a fair return to airlines or lowest cost to the public.

Fare set main issue that governs airlines.

How high should CAB permit non-subsidized airlines' rates on investment to be before cutting fare?

CAB CAB policy was to permit airlines to set fare rates on investment. Since the subsidy and rate was generally granted to interstate airlines, airlines often forced lower fare CAB, with absolute control over the airlines' fares, high low consequences about the proceeding with fare this now, when local domestic airlines are completely free from investor or subsidy.

New fifth airline member by newly selected airline for more than two years has raised a totally new rate-making position. Returns now depend on the line level.

• Setting fares "in the public interest" is a new slogan competitive industry, airlines can argue point to equity supply of demand. But the same-time public, CAB regulated airlines can do that. So placing the product is the CAB member—airline, government

operated rate lines regardless of local conditions—resolves the link of price increasing without experimenting.

• Five top in a secondary issue in this investigation. Some airlines and Board officials propose that seat fare per mile is associated with costs. Flying a passenger 100 mi. now cost 4 cents a mile, while flying him 2,000 mi. cost only 3 cents a mile. Yet the all-inclusive fare cost virtually 4 cents a mile today. However, airline transport commission publicly issuing standard fare substantially, and kindred research lines are down to 4 cents a mile. So many observers calculate that the great part of fare cost may not be fare itself.

• Time lag in the final vote as the new rate-making investigation Bureau forecasts of the airlines changed twice since the investigation started a year ago. The Board proved more ready correct its forecasting. It predicted moderate rate but properly through the first half of last year and a boom the second half.

However, it may be another six months to a year before CAB can conclude the investigation. Sent from outlook this spring is far continued stability at 1951-52 rates. But a decision based on outlook data might prove wrong if the outlook changes late this year. That

in the Board's decision. Airlines are hands-off. CAB agrees that it has a public responsibility to regulate facets of a protected utility.

Allegheny Wins 3-Year Certificate Renewal

Allegheny Airlines route certificate was renewed last week through the end of 1956 by Civil Aeronautics Board. The Board also approved:

- Route extension of Allegheny (formerly All-American Airways) to new cities between Cleveland-New York and Cleveland-Pittsburgh.
- Midwest Airlines authorization to fly from Chicago-Chicago, N. Y., via its route No. 54 to Bedford, Pa.
- Colonial Airlines extension from Allentown, Pa., to Philadelphia with Airline temporary authorization to serve Lancaster, Pa., on this route.
- Trans World Airlines' suspension from Lancaster, Pa., and Washington, D.C.

Allegheny Airlines' suspension from Washington, W. Va., and when Allegheny starts serving it, East, Pa.

CAB member John Lee agreed on renewal of Allegheny's certificate but noted that CAB must give the carrier's application for a new route from Washington to Chicago via Elm, Clarkburg and Parkersburg and let Airlines also serve to their intermediate points.

CAB has estimated Allegheny's subsidy at about \$3.5 million annually.

Southern Airways Wins Route Renewal

Southern Airways won renewal of its local service route certificate by Civil Aeronautics Board last Dec. 13, 1955. Under the new certificate, effective June 15, Southern will serve 10 cities in Louisiana, Mississippi, Tennessee, Alabama, Georgia, South Carolina, North Carolina and Florida. CAB also estimated Southern's annual subsidy requirement for this service at about \$4.5 million.

Route changes which were approved by the Board:

- Route extension to serve Monroe, La., and Calipatria/Rivers, Miss.
- Route extension to drop the segment from Columbus, Ga., to Charleston, S. C., and stop at Chattanooga, Miss., and New HI, S. C.
- Transitions from services that Southern discontinued are transferred to CAB but not approved the proposed new permits by Eastern at Spartanburg, S. C., Albany, Ga. and Dalton, Ala., by National at Valdosta, Ga. by Chicago & Southern to Greenwood, Miss.



HARMAR D DENNY, (R. light) was the second vote in the CAB election by a CAB member by Charles Oswald Ryan. Denny is on the New South National Executive Board.

Denny Holds Balance in CAB

Balance of power on the five-man Civil Aeronautics Board has fallen to the new Republican member, Harmar Denny. Denny, 51,

Chairman of CAB's Grand Jury Investigation—opposed by all anti-New South wings upon his nomination.

Other significant cases on which he will vote may be decisive this year include:

- Colonial merger with Eastern as National.
- Black Flying Tiger merger.
- Trans-Alabama route case.
- Decision on new route extension applications to be considered at the transcontinental Denver and Oklahoma routes case.
- Denny's true opinion Dec. 31, but Washington agreement predict he will be re-appointed to a full cabinet position.

Airline Policy—In his short experience for Senate confirmation, Denny told the secretary "I don't want to actually myself to the middle long airlines, but the direct or non-direct." He added that he "would be very much advanced of myself if I were classified as an advocate of one or the other."

Aired Line—He felt about outside his local service airlines he said, "I don't think they could meet for public insurance unless they were subsidized, some of them."

Denver—He favored Western when he is not yet prepared to make any further side bets on CAB policy, but he has only stated the job.

Pick—Anastasia—Denny last week stated in his committee meeting K. Vernon Reddick, a CAB member since 1945. Reddick is both a graduate

engineer and lawyer (U.S. New York University, LL.M. Georgetown University).

Five—In becoming a CAB member, he was a top contender for National Advisory Commission for Aeronautics at the Langley Field aeronautical laboratory and later assistant to the executive officer at NASA's Washington head quarters.

Activities—Experience—Denny's activities include: to enter directly as a flyer in World War I, Denny volunteered as a private and won a commission in ground training. He became pilot in charge of ground training at Greater Field, Lake Charles, La., and thereby managed to log about 100 hr pilot time by his self—self-education experience for these days and places.

Rank—where, Denny represented the secretary's committee of the Pittsburgh Chamber of Commerce on several city case notes. The most notable, he says, was the highly controversial Trans World Airlines application to serve San Francisco. He testified in favor of it, because Pittsburgh actually wanted direct service. Denny also was on the support advisory committee of Allegheny County for about 11 years and long has been a member of the Arts Club of Pittsburgh.

Pink—tending Inspector Denver World War II, Denny was assistant inspector for the Eastern Flight Training Command. As part of an Air Force train instructor training team, he says he probably testified to a many pilots in any man in the war. His job was check-

ing up on living conditions and pilot records.

Committee—committee, Denny was by himself a lot about CAB and the airlines when he served on the House Interstate and Foreign Commerce Committee (1951-52).

Politics—The new CAB member's ties with politics was his support and role as Director of Public Safety by Pittsburgh's late Republican mayor in 1931. He served about 11 months, a term cut short by the election of a Democratic mayor.

In 1941, Denny ran for mayor against Charles Scully and lost by 1,200 out of 275,000 votes out. He tried unsuccessfully four years later for the Republican nomination for mayor in 1950, he was elected to Congress from Pennsylvania's 29th District in Pittsburgh, representing another Republican.

But he was then re-elected into a Democratic stronghold out but in last year's election.

On the National Executive Board of the Ray South of America, Denny had contact with President Eisenhower, who also served on the board while president of Columbia University. Denny and Mr. Eisenhower imposed him quarterly in an informal, warm and cooperative person. He was an "Ezra" man from then on, Denny says.

Pittsburgh—Pittsburgh—The Denny family has been associated in Pittsburgh since before 1790, when Ebenezer Denny was Allegheny County commissioner and later Allegheny's first mayor. His grand-grandfather, Hanna Denny was a member of Congress during the year 1819-15.

Denny at 67 is described tall, 64 inches, middle-aged, moderately dark, bald, wide-shouldered, and is called "The Colonel" (Mr. Percé Et Col., Ret.). He is an able and courteous to pilot. (Associated Press).

He attended St. Paul's Episcopalian School and Yale University received his law degree of University of Pittsburgh in 1911, became attorney at law, soon went consulting and chairman of the advisory committee on Denny's report. Although his grandfather and father were wealthy, Denny cut out. The family properties are now divided into 25 parts and have added heavy tax bills.

Ray South—Denny is president of his "70 years in Southern" and 15 years on the national executive board.

His other activities have included American Legion, Carnegie Hero Fund Commission, Board of Western Pennsylvania State College, Society of the Classically Served of the American Revolution, and board of trustees of the First Presbyterian Church of Pittsburgh.

Denny is married to Mrs. J. C. Denny, two daughters and six grandchildren.

Lack of Helicopters

Stymies N. Y. Airways

Lack of suitable rotary helicopters at the heart of New York City is holding up New York Airways plans to expand its service directly into the city, believe the carriers. By NYA Executive Director, James J. Kelly, says that the first annual report issued by the certificate carrier.

He noted that although Los Angeles and Chicago are making stocks of passenger rotary helicopters, no such facilities are available in New York.

Acquisition of helicopter passenger service this year as a limited base between Los Angeles, Newark and N. Y. International (Midwest) airports is anticipated by New York Airways officials, Company said.

The carrier showed operating revenues totaling \$16,917 compared with expense of \$12,361 for the carrier's domestic operating year ending Dec. 31st. The \$4,556 operating loss was accounted to a \$1,617 net by loss operations, according preliminary figures.

New Captain—Mark of the deficit is expected to be made up when Civil Aeronautics Board provides preliminary permits in adjusting NYA's temporary mail rate which is present at 92.5¢ per ton mile for the first 15,000 lbs.

The carrier expects to put into operation this year additional Sikorsky S-55 helicopters so that by the end of 1953 its services will extend from Peekskill,

N. Y., on the north to Trenton and Albany, N. J., on the south—and from Dover, N. J., on the west as well as an expansion to Washington, D. C. West flights will still be from New York to seven S-55.

At the end of March, 1951 New York Airways S-55 had set 1,345 lbs. shift and 150,000 lbs. of mail. It has flown 2,028,571 lb. of mail and flown 13,179 hrs of engine. The letter operation was started in January.

India's Airlines Face Government Opposition

India's parliament in New Delhi is expected to pass an opposition bill this month outlawing the use in domestic routes of two government-owned corporations.

The bill would change the carrier laws.

- Indian Airlines, domestic operator serving all intra-India routes and nearby foreign points in Pakistan, Ceylon, Iran, Hongkong and Burma.
- Air India International, serving long foreign routes.

Since Mar. 1, 1949, the Indian government has paid about \$2.5 million in subsidies to keep the airlines in operation.

Under the provisions of the other aviation bill, the government would buy 12 new aircraft to operate on trunk routes within India and to supplement the present scheduled services of Civil Aviation. DeLatts and Vickers are to be used to operate on feeder routes.

Transfer of aircraft and equipment from private to government ownership would be accomplished through a bill to the government is estimated at \$30 million, of which 10% is to be paid to each to provide line owners.

The new agreement would be set up by the government to aid in administering the nationalized program. As an transport council said a labor relations committee.

J. R. D. Tilly, chairman of Air India International, Ltd., is expected to be named chairman of the new aviation board under K. C. Mahalan, former head of the Indian Purchasing Mission in Washington, has been mentioned as possible chairman of the domestic carrier.

Correction

Trans World Airlines president Ralph Denny's 1952 income was \$20,000 and bonus and total compensation \$26,165, or a total of \$111,765, according to a company report to CAB. Airline World Weekly erroneously reported Apr. 23 that Denny's 1952 income was \$20,000, compensation of \$77,487 a total, together with salary, of \$197,607.

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Experiment in Publicity

Aviation executives had no time acting on an editorial suggestion last Apr. 6 that they report interesting and important activities of their companies to *Aerospace Week* for possible publication as a business intelligence service to readers.

Our staff—the largest working on any single aviation publication—a digged constantly for important technical and commercial news, which we gather, filter and print each week but we have decided to enter the cooperation of our readers in covering important aviation news from hundreds of firms which otherwise would not come to the attention of any publications.

That we launch an experiment in business and technical journalism. For several weeks we shall print the best letters we receive, either in full or abridged. Other letters that are not printed may result in our development of stories, based on further discussion with correspondents.

As we pointed out, most correspondents—even those with public relations departments—fail to take full advantage of the services offered by a carefully staffed business and technical magazine.

There are probably many firms whose services or products are very unusual or outstanding in their differences, or which perform unique or exceedingly valuable jobs. Remember, such news is most vivid and which is unique, little known, quite different, or reports opportunities for great economy, time saving, new technical or business possibilities.

Furthermore, your information must be important to busy business men or technical people—not just a handful. And, necessarily, the judgment of the editors in deciding what is printed must be final.

For example, published below is a cross-section of the most interesting letters, abridged, received in the first week after publication of the editorial on Apr. 6. There must be many more companies with interesting news which has never been published elsewhere.

THE LATEST ON A FLYING CAR

Geoffrey:

Tom editorial on "How to Follow the Yaw Company" . . . prompted me to tell you an old working on the field winging. We completed state test phase of our CAA, ATC but this week which means we can go ahead on the last two Arizona we are flying.

We have completed the production prototype sufficiently to permit the various phases of the state test program, and now move to the parts for the other one have been put together as assemblies. We expect the first production one to be completed in about 30 days and will then submit it to CAA for flight evaluation with the further hope that we can obtain ATC by summer . . .

The new Avconco embody . . . new features, such as automatic switching of the flight controls when the wings are installed in present a hybrid with controls located amongst the fuselage system to eliminate the fuel pump and oil's an overly light shoulder harness, power windshield, and a better than 1000 engine output.

The critical problem still shows our progress. Incidentally, we need part of the credit for getting our state test program completed goes to CAA. They have been more than cooperative with their financial and technical advice, which we could not find suitable had for landing the wings and other components. Being About

based on short legs and other materials, at though we were big airplanes. We are cooperation isn't possible in the industry?

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To the Editor:

We are the largest organization of our type, presently assigned for aircraft delivery throughout the world. We have done the same work for a considerable number of overseas and national manufacturers on the first delivery of their aircraft . . .

We have for the past two years been delivering the de Havilland Doves to Canada and the U.S. We are approaching to do the same before the 180th Dove to be flown across the North Atlantic to this continent. Last week we delivered the first Hawker (Hawker-Dove). This was the first of its type to hit this country. . . . The first Hawk was the prototype model and had the fuel tank. We are ordered by de Havilland that before too long they will have production on the retractable gear version, which will be exported to this country. . . .

We also delivered the first Avro Conquestor reported from East to Tokyo. The second Conquestor is en route to Tokyo. In both the Hawk and Conquestor, Jack Paul, our president, delivered the first of their type and set up the operational program for them to follow.

We at Avconco have enjoyed your factual articles immensely. . . . We pay great attention to your Sunlightlet section.

Frank D. Duggin, Jr., Director of Operations
Avconco, Inc.
Lockhead Air Terminal, Burbank, Cal.

MAKING SOMETHING OUT OF NOTHING

Geoffrey:

I can not ordinarily give to writing letters to the editor in the case of my magazine, the main reason is a regular news feature making to complete or disagree with. As a regular news feature writer, I find your negative notes on commercial with some in all branches of aviation, on new developments, and what's doing what.

We think possibly our service to the aircraft industry is unique, touching all phases of aircraft construction, including other manufacturers.

In 1941, at the request of the Douglas Aircraft Co. Inc., we developed a series of machines which could separate metal parts accurately, reasonably, and quickly. I wish to mention them, such as: lugs, nuts and other similar—everything from two sizes of nuts used by accident in pistons and such nuts to the one size nutting in which we have found as many as 15,000 separate items in process.

Since 1941 we have scaled and returned to the aircraft industry 1,000,000 pounds of small hardware which otherwise would have been used as scrap. We know of only one other such response to industrial operations—Industrial Mills Inc., Canton, O., where president, Mr. Roy C. Buck, was a partner with us during the development of this machinery.

Our company has done work on everything from 18 pounds of metal nuts for a Dornier dealer to 25,000 pounds as one lot out of the country's largest Air Force plane contractors. We are now under contract with McDonnell Aircraft Corp. and have completed in three months over 50,000 pounds of metal industrial hardware. . . .
J. B. Mathison, President
Mathison Metals, Inc.
Oklahoma City 24, Okla.

So you don't need a publicity man to tell us that you are doing work of unusual interest. If you are an executive, write a letter on your face letterhead to the Editor of *AVIATION WEEK*, 180 West 42nd St., New York, 36, N. Y.

—Robert H. Wood

Bendix Torque-Link Steering

A new and better steerable nose gear design . . . Easier and more efficient steering action . . . Important savings in weight, space and maintenance.



Bendix Torque-Link Steering is a rugged self-contained unit which can be built in as an integral part of any nose gear. This simple compact steering unit actually does the work of two conventional mechanisms. The hydraulic power cylinders take the place of the upper steering members of standard torque links. They serve the double purpose of torque links and steering actuators. Thus, with one less performing part functions, Bendix Torque-Link Steering retains its important savings in weight, space and maintenance.

In addition, steering dampening is more effective because dampening fluid can be applied as a piston where there is the least amount of spring action in the system.

Although Bendix Torque-Link Steering is a new concept of nose gear steering, it has been in the hands of test pilots and ground crews for several months. It is now being used in several of the newer planes with excellent results. Bendix engineers welcome the opportunity to meet all ground designers in the application of the Torque-Link Steering to their new airplanes.

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